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Psychological distress, coping, and emotional regulation in Swiss recruits, junior cadre and officers; results from cross-sectional studies

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Overview and background

The military has been a field for psychology both in research and practice since World War 1. The conscription of thousands of US soldiers in 1917 demanded the evaluation of the intellectual and emotional capacities of conscripts, which resulted in the creation of the Army Alpha and the Army Beta tests, the first ever group-administered psychological testing of such a scale (Laurence & Matthews, 2012). In the 1920s, the Swiss Armed Forces developed similar "psychotechnical" exams, and in the 1930s, the German *Reichswehr* introduced a precursor of the assessment centre method for the selection of officers; the Royal Navy and British Army soon followed suite (Annen, Nakkas & Gehring, 2017).

After World War 2, different countries and alliances developed diverse requirements for their armed forces depending on their geostrategic doctrines. While the US and British armed forces remained focused on classical warfare, European armies – including Switzerland's – began to orient themselves more towards military operations other than war (MOOTW), i.e., military operations that focus on deterring war, resolving conflict, promoting peace, and supporting civil authorities in response to domestic crises. The Swiss Armed Forces' constitutional mission, e.g., is "*to prevent war and to maintain peace; […] defend the country and its population […] support the civilian authorities in safeguarding the country against serious threats to internal security and in dealing with exceptional situations*" (Federal Constitution of the Swiss Confederation, art. LVIII, § 2).

These differing mission profiles and their associated demands also influence the selection, personnel management, leadership and training within the world's armed forces. The Swiss Armed Forces' primary task consists not primarily of military operations, but training. Furthermore, due to Switzerland's militia system and its compulsory military service, its armed forces have centred their training doctrine strongly on the fact that 98% of all service members are "citizens in uniform", i.e., regular civilians required to do 18 weeks of basic military training at the age of 19 and subsequently three weeks of "refresher courses" each year until they have reached the age of at least 32. Steiger's seminal textbook on military leadership "*Menschenorientierte Führung*" [*people-oriented leadership*] (1990) took this into account and integrated Bass' Theory of Transformational Leadership (1985) for use in the Swiss Armed Forces, and it

subsequently became doctrine for all leadership training in the Swiss Armed Forces. The process of transferring insights from the civilian domain of leadership research to the military came full circle when Steiger's textbook was republished in its supplemented 16th edition in 2013 for an exclusively civilian target audience.

It is in this context of Swiss military psychology – at the intersection of the military and civilian domain – that my PhD research was conducted. As a research assistant at the Department of Military Psychology Studies at the Military Academy at the ETH Zurich (MILAK/ETHZ), I did basic scientific research whose findings often awaited implementation due to the slow-grinding wheels of bureaucracy encountered in all large administrations. My subsequent position as Head of Psychology of the Psychologic-Pedagogic Service of the Swiss Armed Forces (PPD A) moved me into a position, however, that allowed me to conduct research of a more applied nature, and, more importantly, gave me the possibility to implement the findings into practice. This research needed to be theory-guided in order to prevent scientific arbitrariness. While initially I had planned to use Adler and Castro's occupational mental health model for the military (2013) for my PhD research studies, I eventually moved away from doing so. Far from that model being unsound or inadequate, it focused too strongly on the mission profile of the US armed forces, i.e., classic warfare. As lined out, the Swiss Armed Forces is an "*Ausbildungsarmee*" [*training army*], and only 250 service personnel (less than 0.2% of its manpower) are currently deployed in military operations abroad under a UN mandate (SWISSINT, 2020). I thus chose to use a theoretical framework specifically modelled to suit the necessities of the Swiss Armed Forces, i.e., the holistic model of military psychological research (Fig. 1; Annen, 2014). This model is based on the following axioms (Annen, Nakkas & Gehring, 2017):

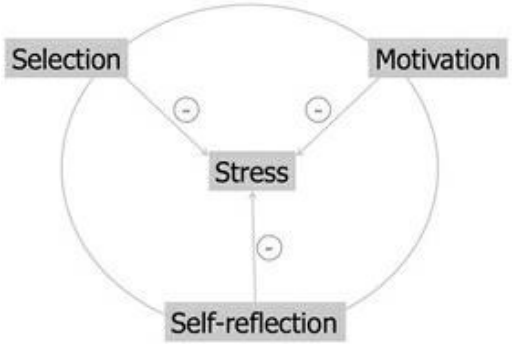

Fig. 1: The holistic model of military psychological research (Annen, 2014).

1) Stress is a result of perceived excessive demands. Objective, reliable and valid *selection* procedures over the entire course of a service member's military career can reduce the risk of military personnel (specifically cadre) being overstrained by the demands of their job and/or function.
2) Motivated people are less stressed; identifying relevant *motivational* factors both in everyday military life as well as in more demanding situations can thus contribute to foster awareness in military cadre for the specific needs of their subordinates in military training.
3) *Self-reflection* contributes to resilience in military personnel of all hierarchical levels, as it allows choosing and engaging in effective coping strategies that are adequate for a given situation. In military cadre specifically, fostering self-reflection can play a crucial role in their development and advancement as credible and competent leaders, reducing the risk of promoting toxic leaders who in turn become stressors for their subordinates.

Based on this model it is possible to conduct research suited to the current tasks and missions of the Swiss Armed Forces. I thus undertook a series of studies conducted in the context of basic military training of the Swiss Armed Forces in order to address research desiderata that I encountered as a research assistant at the MILAK/ETHZ and as Head of Psychology of the PPD A. In this latter function I am responsible for the doctrine of the counselling service for military personnel. The majority of these clients are recruits that develop psychological and psychosocial problems due to basic training, i.e., adjustment disorders, acute stress reactions, anxiety towards shooting training and/or rifles, mild to moderate depressive episodes, and dysfunctional coping behaviour (e.g., hostility and aggression, substance abuse, etc.). While all conscripts undergo physical and psychological examinations during a two-day recruitment prior to basic training, there is inevitably a proportion of false negatives that develop psychological problems during training. Specific triggers for such issues can be the culture shock of entering and/or maladaptively transitioning into a "greedy institution" such as the army (Segal, 1986) and losing a large amount of autonomy; being recommended for promotion against the will of the recruit himself[1] (thus prolonging his stay in the army for a year or longer); experiencing bullying/mobbing by their peers or superiors, or simply

[1] Swiss Military Law (art. XV) allows the Swiss Armed Forces to obligate recruits to take on higher ranks and functions.

lacking the resilience to deal with the elevated physical and emotional stress of basic training. The counselling service of the PPD A on average manages to reintegrate around 60% of all cases into basic training routine; the rest, however, is assessed as lacking aptitude for military service and drops out of basic training.

My research focus was thus centred on identifying factors that are associated with the full spectrum of aptitude for military service, i.e., ranging from basic training drop-outs on the negative tail to junior military cadre (squad and platoon leaders) candidates on the positive tail of the distribution. While the resulting findings of these research studies may eventually also find their way into the recruitment process of conscripts, they will first and foremost be applied to the counselling practice of the PPD A, and assist its military mental health specialists in counselling recruits and consulting military cadre on how to adequately manage those of their subordinates with psychological problems.

The present research statement is structured as follows:

Following a brief explanation regarding the categorization of the studies within the holistic model of military psychological research, I shall develop the case for each study.

1) Selection and Stress

Anecdotal evidence from the counselling service of the PPD A indicated that a proportion of psychological issues of recruits seeking support stemmed from dysfunctional leadership behaviour on part of the junior military cadre, consisting mainly of inadequate social behaviour. This observation constituted the context of discovery for our first study. Junior military cadre must meet high standards. On the one hand, they are accountable for implementing basic training and must answer to their superior officers; on the other hand, they are recruits' first point of contact in disciplinary and personal matters. This combination of technical and social demands can constitute a stressor for many junior military cadres. It requires that on the one hand they cope with that stress for the mere reason of staying mentally balanced, and on the other hand that they exhibit both task orientation and people orientation – the two main behavioural dimensions in classical leadership theory (Bass, 2008) – in order to adequately perform their duties. While potential junior military cadre candidates are already earmarked during the recruitment process, this selection constitutes more of an exclusion criterium,

as almost 75% of all conscripts receive such an earmark. The main selection process takes place when the recruits' superior officers conduct the first round of interviews beginning with week five of basic training. This process is based on the structured assessment of self- and social-competencies (amongst other skills), but it is not fully standardized in order to cater to the heterogenous needs of the different service branches and training units (Schweizer Armee, 2012). Superior officers thus have a considerable amount of autonomy in qualifying recruits.

The literature on civilian leadership research has shown that stressed leaders have a negative effect on their subordinates' performance and wellbeing (Mohr & Wolfram, 2010), and that an active coping style is associated with more effective leadership by subordinates (Pratch & Jacobowitz, 1996). Military psychological research has produced similar findings. An experiment with Reserve Officer Training Course cadets indicated that social stress negatively affected their leadership decisions (Fiedler, Potter & McGuire, 1992). Conversely, the military cadre's own stress resistance acted as a top-down stress buffer for their subordinates' stress levels, as soldiers who attributed high leadership skills to their superiors suffered from less stress (Bartone, 2006; Bliese, 2006; Castro & McGurk, 2007). Compared to soldiers, noncommissioned officers (NCOs) and officers reported less passive coping, a coping style associated with lower psychological well-being (Dolan et al., 2006), and recruits that engaged in emotion-oriented coping were rated as less qualified to become officers or NCOs by their peers (Mikulincer & Florian, 1995). Finally, soft factors such as social judgement skills and agreeableness were shown to be predictive of military leadership performance in West Point cadets (Bartone, Snook & Tremble, 2002).

Taken together, we knew that stress resistance as well as active and problem-oriented coping were associated with stronger *leadership effectiveness* in military subjects. We did not know, however, whether *leadership emergence* was associated with stress resistance and coping styles, i.e., whether recruits who go on to receive a recommendation for promotion by their superiors at the end of basic training suffer from less stress during the beginning of basic training (compared to their comrades who do not get promoted). We subsequently formulated our research question as follows: are stress resistance and coping styles of recruits during basic training associated with their superiors' assessment of their leadership potential?

Being conscious of the fact that the anecdotal evidence that initiated the research was based on a sample bias (recruits more often develop psychological issues when their squad leaders exhibit negative leadership behavior as to when they exhibit positive behavior), we hypothesized that recruits who went on to receive a recommendation for promotion would exhibit lower psychological distress, and higher scores for functional and lower scores for dysfunctional coping styles during basic training.

We tested these hypotheses with 675 male recruits (aged 18 to 26 years, *M* = 20.03) of the Swiss Armed Forces and compared recruits who received a recommendation for promotion at the end of basic training (*n* = 100) with recruits who did not (*n* = 575) in a cross-sectional study; this group allocation was necessarily determined *a posteriori* (Nakkas, Annen & Brand, 2016). Participants completed a series of standardized questionnaires related to sociodemographic information, psychological distress (using the Symptom Checklist-90-Revised SCL-90-R), and coping styles (using the Individual Coping Questionnaire INCOPE-2). Psychological distress was measured during week four of basic training. Coping style in its conceptualization as a stable trait variable (Beutler, Moos & Lane, 2003) was measured during the first week of basic training. We found that after one month of basic training prospective junior military cadre exhibited lower depression and hostility scores, and higher scores for active coping than recruits who would not receive a recommendation for promotion. We were thus also able to confirm that recruits who impress their superior officers as qualified for promotion do not just exhibit stress-moderating traits such as hardiness (Maddi, Harvey, Resurreccion, Giatras & Raganold, 2007; Westman, 1990), but less actual distress itself. The latter had, to the best of our knowledge, never been empirically validated. Our results also suggest that the superior officers in charge of recruits attach special importance to social skills and prosocial behavior in their assessment of the recruits' leadership qualities, and that leadership emergence is associated with stress resistance and coping styles.

In order to complete the picture with regard to senior military cadres, a follow-up study (Annen et al., 2017) examined whether antagonistic behavior in interpersonal situations – as expressed in the Dark Triad (Paulhus & Williams, 2002) and vulnerable narcissism – were associated with mental toughness and subjective stress in US military cadre (*n* = 238) and Swiss military cadre (*n* = 220). The Dark Triad has been shown to

correlate positively with professional success (Spurk, Keller & Hirschi, 2016), but in recent years there has been criticism of its predictive validity (Paleczek, Bergner & Rybnicek, 2018). Our results showed that participants with high levels of vulnerable narcissism scored higher on the Dark Triad and exhibited more subjective stress and lower mental toughness. This pattern of results calls into question to what extent Dark Triad traits might be a predictor for greater vocational success, as specifically vulnerable narcissism seems to be key for more unfavourable behaviour. We were thus able to show that socially antagonistic behaviour is not only negatively associated with leadership emergence in junior military cadre, but that it is also associated with traits that are detrimental to professional advancement in senior military cadre.

2) Self-reflection and Stress

Once more, anecdotal evidence from the counselling service of the PPD A suggested that a disproportional number of recruits seeking counselling had a migration background. As a Swiss citizen and member of the Swiss Armed Forces with a migration background myself, this observation raised my interest from a personal, socio-political as well as psychological point of view, and constituted the context of discovery for the following research study. It had been my own experience that basic military training had brought me into contact with a diverse cross-section of Swiss society (e.g., both regarding linguistic, ethnic, religious, and political background, and sexual orientation). It had also left me with the conviction that I had benefited from this experience both psychologically and socially.

Military sociological research corroborates these subjective conclusions. Studies suggest that military service contributes to the construction of cohesive national communities due to its socializing effect and by enabling contacts between various ethnic, religious, and socioeconomic groups (Krebs, 2004). With their bridging hypothesis, Browning, Lopreato and Poston (1973) had proposed that military service especially benefits ethnic minorities, as it provides them with experiences that facilitate their entry into the civilian workforce. This has indeed been shown to be the case in all-volunteer forces (Bouffard, 2005). However, as our observations suggested, there is a risk that basic military training itself might result in greater stress and higher drop-out rates for minority recruits, thus preventing any such bridging effect. Individuals with a

migration background have been shown to be more vulnerable to stressors and have a higher prevalence of stress-related mental problems (Bhugra, 2004; Pumariega, Rothe & Pumariega, 2005). There are also strong indications that coping mechanisms in minorities vary by their ethnic background (Anderson & Mayes, 2010). Adolescents from ethnic minorities engage in more maladaptive and avoidance coping under psychological distress (Gonzales, Tein, Sandler & Friedman, 2016; Grant et al., 2016; Tschann, Flores, Pasch & Marin, 2005).

Transcultural mental health studies recommend surveying the specific ethnicity of study subjects (Bratter & Eschbach, 2005). Given the fact that half of all naturalized Swiss citizens in the recent years are of Turkish and Balkan extraction (Rausa & Reist, 2008) and that these ethnic backgrounds share many cultural and religious similarities due to a common history in the Ottoman Empire, we focused on somatization in recruits with an ethnic background from Turkey and the Balkans. Psychopathological symptomatology, especially medically unexplained physical symptoms (MUPS) in minorities vary by their ethnic background (Rohlof, Knipscheer & Kleber, 2014), and transcultural psychiatric research has shown that specifically Turkish migrants somatize depressive disorders more strongly (Aigner et al., 2007; Beirens & Fontaine, 2011; Bengi-Arslan, Verhulst & Crijnen, 2002; Kellner, Halder, Litschi & Sprott; 2013; Schrier et al., 2010). While Turkish and Balkan immigrants utilize medical services significantly more often than their Swiss counterparts, the frequency of their utilization of mental health services does not differ (Fasel, Frick & Baer, 2010). This is congruent with the abovementioned proclivity to somatize psychological distress as well as the findings that this underlying sickness behavior is modeled after parental behavior (Uluşahin, Başoğlu & Paykel, 1994). It is also congruent with findings that male adolescents who endorse a culture of machismo consider the expression of psychological symptoms a weakness and view the expression of somatic symptoms as more acceptable (Choi & Park, 2006).

The incidence of somatic health problems during basic training in the Swiss Armed Forces is significantly elevated compared to the civilian baseline, and together with accidents, somatic health issues constitute the principal reason for recruits to drop out of basic training (Wyss, Roos, Hofstetter, Frey & Mäder, 2014). Elevated drop-out rates of ethnic minority groups in basic training would undermine draft equity in a conscription-based army such as the Swiss Armed Forces. Military service would thus

risk contributing to social divisiveness and prevent any positive socioeconomic effects for minority groups as postulated by the bridging hypothesis (Browning, Lopreato and Poston, 1973).

Given this theoretical background, our research questions were as follows: do Swiss recruits with a migration background in general (and specifically from Turkey and the Balkans) express psychological stress in a different pattern than their autochthonous comrades, and do they cope with psychological stress differently? We translated our research questions into the following two specific hypotheses. Firstly, we postulated that recruits with an ethnic background from Turkey or the Balkans exhibit significantly higher levels of somatization during basic training, even when controlling for social support, a factor associated with migration background (Chapman & Mullis, 2000) and acculturative stress (Crockett et al., 2007; Sirin et al., 2013). Second, we expected that recruits with any kind of ethnic minority background engage in significantly less functional coping strategies and significantly more dysfunctional coping strategies during basic training.

In order to test these hypotheses, we recruited 741 male recruits (aged 18 to 26 years, M = 20.01) of the Swiss Armed Forces and compared autochthonous recruits (n = 660) with recruits from Turkey and the Balkans (n = 44) and recruits with any other migration background (n = 37) in a cross-sectional study during the third week of basic training (Nakkas, Annen & Brand, 2019). The recruits' ethnocultural background was operationalized based on self-reported predominant use of their parents' native language at home (Berry, Phinney, Sam & Vedder, 2006; Fishman & García, 2001; Phinney, Romero, Nava & Huang, 2001). Participants completed a series of standardized questionnaires covering sociodemographic information, psychological distress (using the SCL-90-R), coping styles (using the INCOPE-2) and social support (using the Social Support Questionnaire F-SozU).

We found that recruits with the heterogeneous ethnic background exhibited significantly higher levels of somatization than their autochthonous comrades. Coping styles did not differ amongst any of the groups. Higher levels of social support, however, were slightly associated with lower dysfunctional coping and moderately associated with lower functional coping. Even though our hypotheses were not confirmed, we nonetheless were able to show that greater somatization in members of ethnic minorities occurs also in naturalized young adults in a highly specific situation such as basic

military training. We concluded that military doctors and military mental health professionals should consider these results when engaging with recruits from ethnic minorities, as cross-cultural miscommunication can hamper clinical encounters (Kagawa-Singer & Kassim-Lakha, 2003). Somatic complaints or MUPS can mask affective problems or be part of an adjustment disorder symptomatology. Awareness of this can contribute to reduce the risk of misdiagnosis. Furthermore, fostering introspection and self-reflection in somatizing recruits with regard to the psychological dimension of their stress may contribute to therapeutic success.

A common issue encountered in our research was that in order to receive the permission to conduct psychological research “in the field” (i.e., in the context of military training), we were required to keep subject burdening as low as possible in order not to disturb training routine too much. We thus were obligated to use exclusively psychometric measures, and preferably questionnaires as short as possible. This necessarily limited the scope of our research, but it also forced us to apply as sound and valid methods as possible. However, the research project PROGRESS allowed us to attempt to bridge this gap. PROGRESS was a collaborative project between the Swiss Federal Institute of Sport Magglingen (SFISM), the MILAK/ETHZ, the University of Zurich, and the PPD A. Its aim was to examine the effects of progressive physical and mental stress on fitness, injuries, motivation and drop-out rates of recruits in basic training in a longitudinal study design (Wyss, Roos, Hofstetter, Frey & Mäder, 2014). Within the scope of this project, not only several psychometric variables were measured, but also psychophysiological variables, e.g., salivary cortisol and heart rate variability, as dependent variables in response to a social stressor (i.e., the Trier Social Stress Test TSST; Boesch et al., 2014; Nater et al., 2005) and an autonomic stressor (i.e., the Cold Face Test; Heath & Downey, 1990).

Once more originating from observations made in the counselling service of the PPD A, we had noticed that a significant component of the clients’ distress is due to their difficulty dealing with the negative affect they developed as a reaction to a situation they hadn’t sought out themselves (i.e., due to conscription). Inasmuch as such recruits are not able to change the situation itself at their own whim, a very simplistic expression of problem-oriented coping (e.g., leaving basic training) is not possible. Thus, engaging in emotion-oriented coping would appear to be the most useful (at least short-term)

strategy. This necessitates, however, that those recruits are able to adequately engage in emotional self-regulation (ESR).

ESR has shown to have a beneficial effect on mental health in general (Baumeister & Vohs, 2004; Gross & Muñoz, 1995, Kadzikowska-Wrzosek, 2012), and under stressful circumstances specifically (Extremera & Rey, 2015; Stanton, 2010). A meta-analytical review by Campos, Iraurgui, Páez and Velasco (2004) confirmed that emotional processing – in the form of reappraisal and positive re-evaluation – belonged to the most functional coping strategies. Already Lazarus and Folkman (1999) were able to show that reappraisal and suppression are effective emotion regulation techniques to alter the affective components of stress.

Porges' Polyvagal Theory suggests that emotion regulation is associated with the functions of the ventral vagal complex (Porges, 1995, 2003). Similarly, the Neurovisceral Integration Model suggests that vagally-mediated heart rate variability (vmHRV) serves as an indicator of parasympathetic control over psychological and health-related processes (Appelhans & Luecken, 2006; Thayer, Åhs, Fredrikson, Sollers, & Wager, 2012). Parasympathetic function such as resting vagal tone has been linked to several aspects of mental health and emotional coping (El-Sheikh, Harger, & Whitson, 2001; Kok & Fredrickson, 2010; Oveis et al., 2009). In experimental settings, too, higher resilience was associated with greater vagal withdrawal during psychological stress and more pronounced vagal activation afterwards, i.e., better cardiac recovery (Egizio et al., 2008; Souza et al., 2007; Souza et al., 2013; Tugade & Fredrickson, 2004; Weber et al., 2010). Similarly, vagal withdrawal in response to a strong emotional stimulus was associated with adaptive emotion regulation (Gentzler, Santucci, Kovacs, & Fox, 2009) and effective emotion regulation (Katz & Rigterink, 2012).

With the initially stated necessity of using short psychometric measures in our applied research, the observation that ESR was often lacking in our clients, and the knowledge that emotion regulation is based at least partially on an underlying parasympathetic substrate, we posed the following research question: does the psychophysiological assessment of parasympathetic vagal function correlate sufficiently with psychometrically measured ESR to warrant the exclusive use of the latter in a counselling or research setting? We subsequently hypothesized that higher ESR scores are associated with higher resting (i.e., baseline) vmHRV; that higher ESR scores are

associated with increased vmHRV during a purely physiological stimulus of cardiac vagal function (controlling for baseline activity); and that higher ESR scores are associated with greater vagal withdrawal (i.e., greater vmHRV decrease) during recovery from that purely physiological test of cardiac vagal function (controlling for baseline activity).

Having been a member of the PROGRESS research committee, I was able to draw from its existing dataset to test these hypotheses (Nakkas, Annen & Brand, submitted). We used the data of 213 male recruits (age: *M* = 20.29) and examined their scores in the Emotion Regulation Questionnaire ERQ (Gross & John, 2003). The ERQ is a 10-item questionnaire and measures one's tendency to regulate emotions; it consists of two scales, *Cognitive Reappraisal*, consisting of six items, and *Expressive Suppression*, consisting of four items. We also examined the participants' vmHRV during the Cold Face Test (CFT), a test of autonomic pathways (Heath & Downey, 1990) and cardiac vagal function (Khurana & Wu, 2006), for four minutes. Cardiac activity had been measured with an ECG, and we operationalized the vmHRV as the natural logarithm of the average of the absolute power of the ECG's high frequency (HF) band, i.e., LnHF (Appelhans & Luecken, 2006; Egizio, Eddy, Robinson, & Jennings, 2011).

Our results showed that while resting cardiac vagal activity was barely correlated with the *Cognitive Reappraisal* scores (p = .06), there was no association between the ERQ scores and the cardiac vagal activity during the CFT itself. However, there was a significant partial correlation between *Cognitive Reappraisal* and the vmHRV during recovery from the CFT, i.e., with vagal withdrawal. We were thus able to show that the cognitive dimension of psychometrically assessed emotion regulation – even when measured with a scale of merely six items – is reflected in the parasympathetic response to a purely physiological (i.e., non-emotional) stressor. From a methodological point of view, this adds convergent and concurrent validity to the self-report measurement of emotion regulation. Depending on the research question, this also suggests that psychometric assessment of emotion regulation can legitimately replace psychophysiological measures. At the very least it legitimizes its use in field research, thus not only lessening the burden on research participants, but also reducing logistical efforts and expenses for researchers.

My research activities do not come to an end with the presentation of this thesis in psychology. During the first wave of the recent Corona pandemic this year I was able to screen all 4000 service members of the Swiss Armed Forces (primarily from the medical corps) who had been mobilised for three months of civil support service of the civilian health system. Each of these service members had to complete a questionnaire consisting of the Brief Symptom Inventory BSI-18 (Derogatis, 2000) and the PTSD-Checklist Military Version PCL-M (Weathers, Huska & Keane, 1994) during demobilisation in order to make sure that none of them was sent back home with unaddressed psychological problems resulting from troubling experiences while caring for Covid-19 patients. Furthermore, because all recruits in basic training during that first wave had to spend several weeks unable to return home during the weekends as a precautionary measure (and contrary to the usual routine), we also surveyed almost 6000 recruits at the end of basic training. This constituted around 66% of the entire cohort of recruits. They completed a questionnaire consisting of the Brief Resilience Scale BRS (Smith et al., 2008) and the Perceived Stress Questionnaire PSQ20 (Fliege et al., 2005). Results from both surveys await further processing and eventual publication.

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Appendices

Articles referenced by order of appearance in text

A) Curriculum Vitæ
B) Nakkas, C., Annen, H., & Brand, S. (2016). Psychological distress and coping in military cadre candidates. *Neuropsychiatric Disease and Treatment, 12*, 2237-2243.
C) Annen, H., Nakkas, C., Sadeghi Bahmani, D., Gerber, M., Holsboer-Trachsler, E., & Brand, S. (2017). Vulnerable narcissism as key link between dark triad traits, mental toughness, sleep quality and stress. *European Psychiatry, 41*(Supplement), S261.
D) Nakkas, C., Annen, H., & Brand, S. (2019). Somatization and Coping in Ethnic Minority Recruits. *Military Medicine, 184*(11-12), e680-e685.
E) Nakkas, C., Bösch, M., LaMarca, R., Wyss, T., Annen, H., & Brand, S. (in press). Self-reported emotion regulation is associated with response to test of cardiac vagal function. *Journal of Psychophysiology*.

Curriculum Vitæ

- CV aus Datenschutzgründen in der elektronischen Version weggelassen
- CV omitted from the electronic version for data protection reasons

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ORIGINAL RESEARCH

Psychological distress and coping in military cadre candidates

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Background: Soldiers must cope with stressors during both military operations and training if they are to accomplish their missions successfully and stay mentally stable. This holds true particularly for military superiors, as they bear greater responsibilities and must meet greater demands during both deployment and training. Accordingly, in the present study, we investigated whether recruits chosen for further promotion at the end of basic training differed with regard to psychological distress and coping strategies from those not chosen for promotion, and whether recruits' coping styles and distress levels were associated.

Methods: A total of 675 Swiss recruits took part in the study. At the beginning of basic training, recruits filled out self-rating questionnaires covering demographic data, psychological distress (depression, somatization, anxiety, interpersonal sensitivity, and hostility), and coping styles. Results were compared between those recruits who received a recommendation for further promotion at the end of basic training and those who did not.

Results: Recruits selected for promotion had lower scores for depressive symptoms and hostility, engaged more in active coping, and considered their coping to be more effective. Dysfunctional and functional coping were associated with higher and lower distress levels, respectively.

Conclusion: Recruits recommended for promotion exhibited less psychological distress during basic training and exhibited a socially more conducive profile of distress. They also endorsed more efficient and more prosocial coping strategies than those recruits not recommended for promotion. These cognitive–emotional features not only contribute to resilience but are also consistent with leadership research, indicating the importance of emotional stability and prosocial behavior in successful leaders.

Keywords: military, training, stress, recruits, coping, leadership

Introduction

By definition, soldiers do dangerous and stressful work, and military personnel have an elevated risk of suffering from stress-related disorders following military deployment.[1] The risks of developing other psychological disorders such as depression, anxiety, and alcohol abuse are also higher.[2] Although the military operates under different conditions in peace and war, military training in peacetime is nonetheless intended to provide preparation for combat situations. Its goal is to enable service personnel to perform under adverse conditions that offer little control, as a soldier's performance in military operations is mission-critical and allows for little leeway.[3]

It thus comes as no surprise that basic military training itself has also been shown to be a biopsychosocial stressor, resulting in elevated cortisol levels[4–7] and elevated self-reported psychological distress.[8–10] Although most recruits adapt to basic training,[9,11] the literature also includes reports of fluctuating levels of stress and negative mood over time.[8,9,12]

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Research indicates that stress resistance is a predictor for successful completion of demanding training courses such as basic military training. High levels of hardiness, for example, predict successful graduation from officer training[13] and firefighter training[14] and reduce the risk of developing psychological problems during military training.[15] Coping strategies have also been shown to reduce the negative effects of stress on psychological health. Although emotion-oriented and avoidance coping is generally related to negative health outcomes, problem- and approach-oriented coping is associated with positive health outcomes.[16,17] In a military setting, Mikulincer and Florian[18] found that recruits who engaged in emotion-oriented coping considered basic training as threatening, whereas recruits who engaged in problem-oriented coping considered it as a challenge. In addition, the more effective a recruit appraised his coping in basic training, the more likely he was to engage in problem-oriented coping, and the less likely he was to engage in emotion-oriented coping. In the present study, we thus also assessed the coping styles of recruits during basic training.

Why is it important to know how recruits experience stress during basic training and how they cope with it? If recruits in general need to be able to withstand the hardships of military training, this holds true particularly for the prospective leaders among them. Junior military cadre, ie, squad leaders and platoon leaders, must meet high demands. On the one hand, they are accountable for implementing basic training and must answer to their superior officers, on the other they are their subordinates' first point of contact in disciplinary and personal matters. This combination of technical and social demands is a stressor in itself and requires that they exhibit both task orientation and people orientation, the two main behavioral dimensions in classical leadership theory.[19]

Research on leadership emergence, ie, the psychological preconditions that predict the emergence of leadership in groups, also points toward stress resistance as a distinguishing factor.[20] Studies on vertebrates have shown that in contrast to the "reactive" phenotype, "proactive" animals exhibit endocrine and behavioral responses to stress that promote leadership emergence, eg, lower levels of hypothalamic–pituitary–adrenocortical axis hormones, higher adrenaline levels, and higher likelihood of initiation of and adherence to social interaction.[21] This coincides with research on leadership emergence in humans: emergent leaders adjust better to stressful situations[22] and exhibit higher levels of agreeableness and openness to new experiences.[23,24] In addition, elevated hypothalamic–pituitary–adrenocortical axis responses are often associated with higher aggression.[25,26] We thus anticipated that recruits who reported less psychosocial stress and more active and problem-oriented coping styles would be perceived as promising cadre by their superiors. In contrast, leadership stress has been shown to have negative effects on performance both in civilian[27] and military settings. Fiedler et al[28] showed in an experiment with Reserve Officer Training Course cadets that social stress negatively affected leadership decisions. Conversely, the military cadre's own stress resistance acted as a top–down stress buffer for their subordinates' stress levels, as soldiers who attributed high leadership skills to their superiors suffered from less stress.[29–31] West Point cadets exhibited both effective problem- and emotion-oriented coping (eg, using social support and engaging in physical activity, humor, and rationalization) during basic training,[32] although rank and experience also appear to factor into one's choice of coping style. Compared to soldiers, noncommissioned officers (NCOs) and officers reported less passive coping, which is associated with lower psychological well-being[33] and characterized by avoidance, withdrawal, and wishful thinking (eg, complaining about the situation to ventilate feelings, get sympathy, or elicit help; withdrawing from social activities; and relying on medication).[34] Results from a civilian sample also show that individuals were evaluated as more effective leaders by their subordinates if they exhibited active coping,[35] which is characterized by using one's own resources to deal with a problematic situation, improving the nature of the stressful situation, or modifying one's emotional and/or cognitive reactions (eg, solving problems, reframing the meaning of the problem, and seeking information).[36] Recruits who engaged in mere emotion-oriented coping, however, were rated as less qualified to become officers or NCOs by their peers.[18] Finally, soft factors such as social judgment skills and agreeableness were shown to be predictive of military leadership performance in West Point cadets.[37]

Taken together, from previous research, we know that basic military training is a psychological stressor and that stress resistance as well as active and problem-oriented coping are associated with better mental health outcomes, successful completion of military training, and stronger, more prosocial leadership qualities. We do not know, however, whether future officers and NCOs suffer from less stress during basic training than their comrades who do not get promoted. The aim of the present study was therefore to assess psychological distress and coping strategies among recruits during the first month of basic training and to compare these results between recruits who were recommended for promotion at the end of basic training and those who were not. Accordingly, the following three hypotheses were

formulated: First, following Bartone,[29] Bliese,[30] and Castro,[31] we expected lower psychological distress in recruits who went on to receive a recommendation for promotion compared to recruits who did not. Second, following Dolan et al[33] and Mikulincer and Florian,[18] we expected higher scores for functional and lower scores for dysfunctional coping styles in recruits who went on to receive a recommendation for promotion compared to recruits who did not. Third, based on Penley et al[16] and Taylor and Stanton,[17] we expected that functional coping styles would be associated with lower distress levels, while dysfunctional coping styles would be associated with elevated distress levels.

Methods

Procedure

Two different groups were assessed and compared in the present study, recruits who received a recommendation for promotion at the end of general basic training (ie, week 6) and recruits who did not and remained enlisted for the remainder of their military service. The group allocation was thus necessarily determined a posteriori. The survey was carried out with seven different military units (entire companies) on four training grounds in order to obtain a balance between combat and support troops. Psychological distress was measured during week 4 of basic training. Coping style in its conceptualization as a stable trait variable[38] was measured during the first week of basic training. For both instances, participants were assembled company-wise at the end of a classroom lesson and had 20 minutes to complete a series of standardized questionnaires related to basic sociodemographic data and psychological distress coping styles. They received instructions on how to fill out the questionnaires by two trained officers of the Psychologic-Pedagogic Service of the Swiss Armed Forces, who were assisted by NCOs of the respective training ground. Missing cases were thus prevented and missing values kept to a minimum. Although the present analysis draws on a broader ongoing longitudinal study, the results reported here on psychological distress and coping styles have not been published, discussed, or presented elsewhere. Thus, the findings are novel.

Sample

Written informed consent was obtained from all participants. The Psychologic-Pedagogic Service and Armed Forces Personnel approved the study, which was performed in accordance with the principles laid down in the Declaration of Helsinki. A total of 675 male recruits (aged =18–26 years, M=20.03 years, standard deviation =1.14) of the Swiss Armed Forces were examined in a cross-sectional study during the first 4 weeks of basic military training. Of this sample, 100 were recommended for promotion by their superiors at the end of general basic training, while 575 were not and remained enlisted during the remainder of their service. Although some preenlistment psychometric data are also used in selecting future cadre (eg, IQ), they are used as exclusion rather than inclusion criteria and are thus of only low discriminatory power.

Materials

Psychological distress

Psychological distress was assessed using the Symptom Checklist-90-Revised (SCL-90-R, Pearson, San Antonio, TX, USA), a 90-item self-report symptom inventory designed to reflect psychological symptom patterns with a time reference of the past 7 days.[39] Respondents are asked how much they have been bothered by issues such as faintness or dizziness, crying easily, feeling fearful, or having urges to break or smash things. Distress severity is rated on five-point rating scales with the anchor points 0 (= not at all) to 4 (= extremely); thus, higher scores reflect greater distress. The SCL-90-R is widely used and has been found to be a valid and reliable measure for psychological distress, both in English and in German.[40] In our survey, the original nine dimensions of the SCL-90-R were reduced to the following five: Depression (13 items), Somatization (12 items), Anxiety (ten items), Interpersonal Sensitivity (nine items), and Hostility (six items). The scales Obsessive–Compulsive, Psychoticism, and Paranoia were omitted so as to reduce respondent burden and because recruits with mental disorders on axes 1 and 2 of the DSM-IV are screened out during recruitment and declared unfit for service. The dimensions have internal consistencies ranging from α=0.77 to 0.90, and the inventory itself shows high concurrent validity with the Minnesota Multiphasic Personality Inventory.[39]

Coping

Coping styles were assessed with the Individual Coping Questionnaire (INCOPE-2), a 23-item questionnaire consisting of six subscales that reflect a variety of individual coping strategies for psychosocial stress.[41] Items are rated on five-point rating scales with respect to the frequency with which each coping strategy is used in everyday life, with anchor points 0 (= never) and 4 (= always). The six subscales assess Rumination (four items; eg, intellectual brooding, feeling guilty; α=0.70), Positive Self-Verbalization (three items; eg, humor, positive self-instruction; α=0.74), Active Problem Solving (seven items; eg, active engagement, search for social support; α=0.71), Expression of Negative Emotions

(three items; eg, blaming comrades; α=0.73), Negative Relaxation Strategies (three items; eg, alcohol consumption; α=0.75), and Withdrawal/Avoidance (three items; eg, withdrawal of the stressful event; α=0.86). The subscales have internal consistencies ranging from α=0.70 to α=0.86. Two single items measure the subjective Effectiveness of one's coping style and one's Satisfaction with it. The subscales Rumination, Expression of Negative Emotions, Negative Relaxation Strategies, and Withdrawal/Avoidance are aggregated to the dimension Dysfunctional Coping, while the subscales Positive Self-Verbalization and Active Problem Solving are aggregated to the dimension Functional Coping. Finally, a Total Score indicating positive coping is computed from all items. The dimensions have internal consistencies of α=0.71 for Dysfunctional Coping, α=0.70 for Functional Coping, and α=0.76 for the Total Score, and validation studies have demonstrated satisfactory concurrent and predictive validity.[41]

Statistical analysis

The SCL-90-R dimensions and INCOPE-2 scales were tested for normality and homogenous variances. Both the Kolmogorov–Smirnov test and the Skewness and Kurtosis test revealed significant departures from normal distributions for all scales and dimensions in both groups. Levene tests revealed that all SCL-90 dimensions were heteroscedastic, while INCOPE-2 scales exhibited both heterogeneous and homogenous variances. Consequently, two-tailed Mann–Whitney tests were performed to determine differences in psychological distress and coping styles between the two groups, and two-tailed Spearman rank correlations were performed to test the association between distress levels and coping styles. Missing values were excluded case-wise, and the nominal level of significance was set at α<0.05. All statistical computations were performed with SPSS® 23.0 (IBM Corporation, Armonk, NY, USA) for Windows® and G*Power® 3.1.9 (University of Düsseldorf, Düsseldorf, Germany).[42]

Results

Group differences in psychological distress

The prospective cadre group reported significantly lower Depression scores (Mdn =0.13) than the recruits who remained enlisted (Mdn =0.25), U=25,034.5, P<0.05, r=0.08. Likewise, the prospective cadre group reported significantly lower Hostility scores (Mdn =0.00) than the other recruits (Mdn =0.17), U=24,074.0, P<0.01, r=0.10. Post hoc power computations for the Depression analysis revealed an achieved power of 0.72 and for the Hostility analysis an achieved power of 0.89.

No statistically significant differences between the two groups were observed for the dimensions Somatization, Anxiety, and Interpersonal Sensitivity, with 26,270.0≤ U ≤27,278.5.

Group differences in coping styles

The prospective cadre group reported significantly higher scores for Active Problem Solving (Mdn =2.40) than the other recruits (Mdn =2.20), U=26,051.5, P<0.05, r=0.09. They furthermore reported higher scores for Effectiveness of coping (Mdn =3.00) than the other recruits (Mdn =3.00), U=25,926.5, P<0.05, r=0.09. Although the cadre group reported higher Total Scores (Mdn =0.98) than the other recruits (Mdn =0.79), this difference just failed to reach a significant level, U=26,778.0, P=0.054, r=0.07. Post hoc power computations for the Active Problem Solving analysis revealed an achieved power of 0.33 and for the Effectiveness analysis an achieved power of 0.71.

No statistically significant differences between the two groups were observed for the dimensions Dysfunctional Coping, Functional Coping, Rumination, Positive Self-Verbalization, Expression of Negative Emotions, Negative Relaxation Strategies, and Withdrawal/Avoidance, or for the single item Satisfaction, with 26,977.5≤ U ≤30,219.5.

Association between distress and coping

All correlation coefficients between dimensions of psychological distress and functional and dysfunctional coping styles are reported in Table 1. The pattern of results showed that functional coping correlated negatively and significantly with all distress scales, whereas dysfunctional coping correlated positively and significantly with all distress scales, although less strongly. Post hoc power computations revealed that the achieved power ranged from 0.83 for the lowest correlation coefficient to 0.95 for the highest correlation coefficient.

Table 1 Correlation between coping style and distress levels

	Depression	Somatization	Anxiety	Interpersonal sensitivity	Hostility
Functional coping	–0.19*	–0.13*	–0.19*	–0.15*	–0.22*
Dysfunctional coping	0.17*	0.10**	0.18*	0.15*	0.17*

Notes: *P<0.01, **P<0.05.

Discussion

The key findings of the present study were that the prospective cadre exhibited lower levels of depression and hostility and reported more active and effective coping than the nonprospective cadre recruits. The present data add to the current literature in an important way in that we were able to show that cadre selection as an experts' rating was mirrored by favorable self-rated psychological processes.

Three hypotheses were formulated and each of these is considered in turn. With the first hypothesis, we expected lower psychological distress in prospective cadre compared to nonprospective cadre, and this was partially confirmed. Specifically, prospective cadre had lower depression and hostility scores. This pattern of results matched those of Westman[13] and Maddi et al,[14] in as much as higher stress resistance went along with the successful passing of demanding training courses, eg, basic military training. However, the normative expectation that future military leaders experience less stress than their enlisted comrades has, to the best of our knowledge, never been empirically validated. The present data thus add to the current literature in that we were able to confirm that recruits who impress their superior officers as qualified for promotion do not only exhibit stress-moderating traits such as hardiness but also report less actual (subjective) distress itself. In addition, the results suggest that the superior officers in charge of recruits attach' special importance to social skills and prosocial behavior in their assessment of the recruit's leadership qualities. One of the constituent elements of depression is a lack of social activity,[43] while hostility is characterized by socially antagonistic behavior. In both cases, social behavior is affected in a detrimental way. Low hostility has thus not surprisingly been shown to be closely related to leadership effectiveness in military settings.[22] Similarly, military culture may counterintuitively be characterized by a low level of masculinity.[44–47] Stereotypical masculine values such as competitiveness, materialism, ambition, assertiveness, and personal power are consequently held in low esteem in a military setting. Recruits who impress their superiors as potential cadre seem to do so by exhibiting a proactive element of sociability and by lacking a resentful or vindictive streak. This is consistent with the Swiss Armed Forces' focus on social skills when selecting the cadre, as well as classic leadership theory and its emphasis on people orientation or consideration.[19] These prosocial attitudes and behaviors are not merely of ethical importance; however; they also have their usefulness. Devries postulates that prosocial conduct, eg, affiliative behavior, can provide a coping mechanism with respect to stressful social conditions that arise during the establishment of social rank relationships.[48] This suggests that the prospective cadre's prosocial behavior not only mitigates the potentially negative group dynamics that accompany their leadership emergence but also allows them to cope with their own stress resulting from the concomitant social dynamics.

Our second hypothesis was that more functional and less dysfunctional coping would characterize prospective cadre compared to nonprospective cadre, and this too was partially confirmed. Recruits with a recommendation for promotion at the end of general basic training engaged in more active problem solving, reported more effective coping, and exhibited a tendency to cope more favorably in general. This concurs with findings of both Pratch and Jacobowitz[35] and Mikulincer and Florian,[18] who found that effective junior military leaders engaged less in emotion-oriented and more in problem-oriented coping, with the latter coping style being associated with a more self-efficacious mind set. In view of the results from our first two hypotheses, the combination of low hostility and high sense of coping effectiveness that we found in prospective cadre candidates would also suggest a lower risk of developing psychopathological symptoms after a potentially traumatic experience: a prospective follow-up study with firefighters was able to show that high levels of hostility and low levels of self-efficacy at baseline accounted for half of the variance in posttraumatic stress disorder symptoms after 2 years on the job.[49] It also predicted a significant increase in measures of posttraumatic stress disorder symptoms, depression, anxiety, and general psychological morbidity.

Our third hypothesis was that functional coping strategies would be associated with lower distress scores and that dysfunctional coping would be associated with higher distress scores. Our data confirm this and corroborate studies by Repetti et al[50] and Taylor and Stanton,[17] who were able to show that psychological distress was related to a lack of adequate coping resources. It is noteworthy that functional coping exhibited a greater association with distress than dysfunctional coping. This suggests that it is not so much a lack of dysfunctional coping that contributes to lower psychological distress but rather the presence of functional coping.

Despite the novelty of the results, several limitations warrant against their overgeneralization. First, the sample consisted of only male recruits; accordingly, it is not clear to what extent the present data are also applicable to female recruits. Second, no objective measures were made; it would have increased the validity to investigate to what extent self-ratings of psychological distress and coping strategies were consistent (or inconsistent) with a nonpharmacological stress test such as the Trier Social Stress Test.[51] Third, the analyses

were cross-sectional and correlational; this allows us to draw only conjectural conclusions on the causality of the association between psychological distress and coping styles. Fourth, the effect sizes of the differences in psychological distress and coping styles were small, despite the generally adequate power that was achieved. However, the dichotomous classification of recruits into the groups "promotion" versus "no promotion" is rather crude and ignores many additionally relevant characteristics of the participants, such as social support and life events. Insofar, the small effect sizes are explicable. Finally, it would have been interesting to follow-up both groups of recruits with regard to their military performance in order to gain further insight into the predictive validity of such assessments.

In view of these limitations, further research should focus on a more sophisticated classification of participants and supplement the assessed data with objective measures of stress, eg, salivary cortisol. In addition, a further breakdown of the superiors' appraisal of the recruits' aptitude for promotion would allow the identification of those criteria that are pivotal in the eyes of the superior officers. A promising instrument for future research is the Military Training Mental Toughness Inventory, which is based on the Mental Toughness Inventory.[52] The latter in turn was conceptualized within Gray and McNaughton's neuropsychological framework of the revised Reward Sensitivity Theory, which aims to explain how goal-directed behavior is maintained under stress. Military training mental toughness may moderate the relationship between psychological distress and performance in basic training on the one hand, and reveal a relationship with certain coping styles on the other. Finally, future studies should be longitudinal, thus allowing to draw firm conclusions about the causality of the associations.

Conclusion

The pattern of results suggests that prospective cadre group is able to maintain their social agency even under elevated physical and psychological stress when compared to the members of their cohort who were not recommended for promotion and remained enlisted. The capacity to cope with psychosocial stress and remain influential in a social group goes hand in hand with lower levels of socially adverse stress responses, possibly acting as a buffer. This specific pattern of coping style and stress response has the additional benefit of facilitating the recruit's emergence as a leader by allowing him to develop and utilize his leadership skills under stress, because research on transformational leadership has shown that prosocial interpersonal skills such as individualized consideration are crucial factors in effective leadership.[53]

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Disclosure

The authors report no conflicts of interest in this work.

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replicate results of previous studies in a mixed gender sample of Egyptian outpatients.
Aim The aim of the current study was to examine the effectiveness of DBT without drug replacement relative to treatment as usual "TAU" in improving behavioral outcomes related to SUD and BPD, and improving emotional regulation.
Methods Forty outpatients with co-morbid BPD and SUD in Alexandria and Cairo were assigned for one year either to comprehensive DBT program (20 patients), or TAU defined as ongoing outpatient psychotherapeutic treatment from referring center (20 patients). Patients were assessed at baseline and follow up assessment at 4, 8, 12 and 16 months was done using Arabic version of Difficulties in Emotion Regulation Scale (DERS), urine multidrug screen and time line follow-back method for assessment of alcohol and substance use history.
Results Following one year of treatment, DBT group showed significantly lower doses of drugs used, DERS score, rates of hospital admission, ER visits, suicidal attempts and episodes of NSSI. Also, DBT patients showed markedly increased retention in treatment and longer duration of total alcohol abstinence and other drugs of abuse. Positive outcomes were maintained for four months post-treatment.
Conclusion DBT demonstrated superior efficacy in comparison to TAU for treatment of Egyptian patients suffering from co-morbid borderline personality and substance use disorder across behavioral domains of SUD, BPD and reduction hospital admission, emergency room visits and DERS score.
Disclosure of interest The authors have not supplied their declaration of competing interest.

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EW0455

Empirical redundancy of burnout and depression: Evidence from time-standardized measures

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Introduction Burnout and depression are ordinarily assessed within different time frames. Burnout is most frequently assessed on an annual or a monthly basis whereas depression is generally assessed over a one- or two-week period. This state of affairs may have partly obscured the burnout-depression relationship in past research and contributed to an underestimation of burnout-depression overlap.
Objectives We investigated burnout-depression overlap using time-standardized measures of the two constructs. We additionally examined whether burnout and depression were differently associated with work-related effort and reward, occupational social support, and intention to quit the job.
Methods We enrolled 257 Swiss schoolteachers (76% female; mean age: 45). Burnout was assessed with the Shirom-Melamed Burnout Measure and depression with a dedicated module of the Patient Health Questionnaire. Work-related effort and reward were measured with a short version of the Effort-Reward Imbalance Scale and occupational social support with a subscale of the Job Content Questionnaire. Intention to quit the job was assessed with 3 generic items (e.g., "I plan on leaving my job within the next year").
Results We observed a raw correlation of .82 and a disattenuated correlation of .91 between burnout and depression. Burnout's dimensions (physical fatigue; cognitive weariness; emotional exhaustion) did not correlate more strongly with each other (mean $r = .63$) than with depression (mean $r = .69$). Burnout and depression showed similar associations with the job-related factors under scrutiny.
Conclusions Burnout and depression may be empirically-redundant constructs. Measurement artifacts probably contributed to an underestimation of burnout-depression overlap in many studies.
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EW0456

Vulnerable narcissism as key link between dark triad traits, mental toughness, sleep quality and stress

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Introduction The concept of the Dark Triad (DT) consists of the dimensions of Machiavellianism, narcissism, and psychopathy, and has gained increased interest within the last 15 years for its predictive power to explain success in the fields of economy, politics, and professional sport. However, recent research suggests that the associations between DT and behavior are not as uniform as expected.
Aims Investigating the associations between DT traits and vulnerable narcissism, mental toughness, sleep quality, and stress perception.
Methods A total of 720 participants between 18 and 28 years took part in the study. The sample consisted of military cadres in the US ($n = 238$), Switzerland ($n = 220$), and of students from the university of Basel ($n = 262$). Participants completed self-rating questionnaires covering DT traits, mental toughness, vulnerable narcissism, sleep quality, and perceived stress.
Results Irrespective of the sample, participants scoring high on vulnerable narcissism also reported higher DT traits, lower mental toughness, poor sleep quality, and higher scores on perceived stress.
Conclusions The present pattern of results suggests a more fine-grained association between DT traits and further behavior, calling into question to what extent DT traits might be a predictor for greater success in the fields of economy, politics or elite sports. Specifically, vulnerable narcissism seems to be key for more unfavourable behavior.
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EW0457

Associations between chronotype and schizotypy in healthy adults

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Somatization and Coping in Ethnic Minority Recruits

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ABSTRACT Introduction: Military service can have beneficial social effects on minorities. However, minority groups are also often at greater risk of somatizing psychological distress and coping maladaptively. In military training this would result in lower mental health of minorities and contribute to higher drop-out rates. We thus examined if recruits with different ethnocultural backgrounds report different somatization levels and coping styles. Materials and Methods: Seven hundred and forty male recruits of the Swiss Armed Forces aged 18–26 took part in a cross-sectional study during basic training. Participants filled out self-rating questionnaires covering sociodemographics, somatization (SCL-90-R), coping styles (INCOPE-2), and social support (F-SozU). The recruits' ethnic self-identification was used to compare three groups: native Swiss (89%); Turkish or Balkan minority (5%); heterogeneous ethnic minority (6%). Group differences in somatization scores were tested with a Kruskal–Wallis test; group differences in coping styles were tested with a multivariate ANCOVA, controlling for the level of social support experienced. Results: Recruits from the heterogeneous ethnic minority group reported significantly greater levels of somatization than their native Swiss comrades. Coping styles did not differ between the three ethnic groups, but higher levels of social support were associated with better coping. Conclusion: Military doctors ought to place importance on the differential diagnosis of medically unexplained physical symptoms in ethnic minority recruits. This would contribute to minimize the risk of misdiagnosis. Military mental health professionals who counsel recruits reporting somatic symptoms are advised to be sensitized to an ethnic minority status. Physical complaints could mask affective problems or be part of an adjustment disorder symptomatology.

INTRODUCTION

Military sociological studies suggest that military service contributes to the construction of cohesive national communities because of its socializing effect and by enabling contacts between various ethnic, religious, and socioeconomic groups.[1] With their bridging hypothesis, Browning, Lopreato, and Poston proposed that military service especially benefits ethnic minorities, as it provides them with experiences that facilitate their entry into the civilian workforce.[2] This has indeed been shown to be the case in all-volunteer forces.[3] Furthermore, due to the current demographic changes, experts argue that adapting to ethnic minorities will be imperative for European armed forces confronted with challenges in recruitment and retention.[4,5] There are 87 distinct European ethnicities, of which 33 form the majority population in at least one European nation, while the remaining 54 constitute ethnic minorities.[6] Both the end of World War 2 and the Cold War were followed by extensive migration movements both inside of, as well as into Europe. In this context, research on populations with a migration background (commonly defined as anyone – both foreign nationals and citizens – whose parents were born abroad) pertains to a large degree also to ethnic minorities.

Successfully completing military service can thus contribute to the social situation of ethnic minorities. However, there is a risk that basic military training itself might result in greater stress and higher drop-out rates for minority recruits, thus preventing any bridging effect. Individuals with a migration background have been shown to be more vulnerable to stressors and have a higher prevalence of stress-related mental problems, as they experience several stressors related not only to the preparation and process, but also the aftermath of migration.[7,8] There are also strong indications that psychopathological symptomatology and coping mechanisms in minorities vary by their ethnic background,[9] especially regarding medically unexplained physical symptoms (MUPS).[10]

Ethnic background is also associated with social support, as it is commonly more associated with non-Western traditional cultures.[7,9] Social support is an important salutogenic factor in the psychological well-being of children,[11] is more predominant amongst adolescents of specific ethnic minority groups,[12] and has a beneficial effect on the mental health of immigrants and on immigrant adaptation, i.e., the processes by which newcomers adjust and integrate within a new host society.[13,14] Social support specifically moderates the relation between acculturative stress, i.e., the psychological impact of adaptation to a new culture, and symptoms of anxiety and depression.[15,16]

Transcultural mental health studies recommend surveying the specific ethnicity of study subjects.[17] In this study, we

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focused on somatization (i.e., the unconscious process of expressing psychological distress in the form of physical symptoms) in recruits with an ethnic background from Turkey and the Balkans. Firstly, these ethnicities are often immigrants of the first or second generation, make up half of all naturalized Swiss citizens in the recent years,[18] and share many cultural and religious similarities due to a shared history in the Ottoman Empire. Second, transcultural psychiatric research has shown that Turkish minorities in Europe somatize depressive disorders more strongly.[19–23] Data also indicate that while Turkish and Balkan minorities utilize medical services significantly more often than their Swiss counterparts, the frequency of their utilization of mental health services does not differ.[24] This is consistent with their abovementioned proclivity to somatize psychological distress and lends credence to the suggestion of Uluşahin, Başoğlu, and Paykel[25] of an underlying distinctive sickness behavior that is more likely modeled after parental behavior than resulting from a shared environment. Considering the patriarchal culture of Turkey and the Balkans, Choi and Park's study further explains this phenomenon.[26] They found that male adolescents who endorse a culture of machismo consider the expression of psychological symptoms a weakness and view the expression of somatic symptoms as more acceptable.

Mental health and experience of distress are closely linked to coping styles and behavior. Adolescents from ethnic minorities engage in more maladaptive coping under psychological distress,[27] while avoidance coping has been found to be an adaptive strategy for adolescents from ethnic minorities that are exposed to chronic and severe stressors.[28,29] Similarly, adolescents from ethnic minorities in Switzerland reported to be more pessimistic and had lower self-efficacy expectations than their native Swiss counterparts.[30,31]

To summarize, research has shown that ethnic minorities from Turkey and the Balkans somatize psychological distress more strongly, and that ethnic minority adolescents exhibit less healthy coping than their majority counterparts. We maintain that it is important for military leadership to know if and how somatization and coping differs between recruits of varying ethnic backgrounds. The incidence of somatic health problems during basic training is significantly elevated compared to the civilian baseline, and together with accidents, somatic health issues constitute the principal reason for recruits to drop out of basic training.[32] Identifying high-risk groups is thus indispensable to develop sustainable health promotion. Elevated drop-out rates of ethnic minority groups in basic training also undermine draft equity in a conscription-based army such as the Swiss Armed Forces. Military service would thus risk increasing social divisiveness and prevent any positive socioeconomic effects for minority groups as postulated by the bridging hypothesis.[2]

Given the above described theoretical background, we formulated the following two hypotheses. First, that recruits with an ethnic background from Turkey or the Balkans exhibit significantly higher levels of somatization during basic training when controlling for social support. Second, that recruits with any ethnic minority background report to engage in significantly less functional coping strategies and significantly more dysfunctional coping strategies during basic training.

METHODS

Participants and Procedure

A total of 741 male recruits (aged 18–26 years, $M = 20.01$, $SD = 1.11$) of the Swiss Armed Forces were examined in a cross-sectional study during the third week of the second basic military training course of 2017. Officers of the Psychological-Pedagogical Service conducted the survey. Regarding educational level, 1.2% had attended remedial class, 33.3% lower junior secondary school (vocation-centered), 44.7% higher junior secondary school, 14.2% grammar school, and 6.6% had a tertiary degree. The sample was drawn from seven different military companies and four different training grounds to obtain a balance between combat and support troops. Participants were informed about the basic outlines of the study's aims, the voluntary nature of participation and the secure and anonymous data handling. They gave written informed consent and completed a series of standardized questionnaires covering sociodemographics, psychological distress, coping styles and social support. The institutional review board of the Armed Forces Personnel (J1) approved the study, which was performed in accordance with the principles laid down in the Declaration of Helsinki.

Measures

Socio-demographic data

Participants completed a questionnaire covering gender, age, educational level, vocational training, occupational level, and marital status.

Ethnic background

Ethnic background was operationalized based on the recruits' self-reported predominant use of their parents' native language at home. Language proficiency is a valid and objective measure for cultural maintenance,[33] an essential component of the ethnic identity of minority adolescents,[34] and a predictor of ethnic identity across different ethnicities.[35] Swiss-German and French were coded *Native* and constituted the native group. Turkish, Serbo-Croatian, Bosnian, Albanian, Macedonian, Greek, Bulgarian, Slovenian and Romanian were coded as *Turkish & Balkans*.[36] All other languages (i.e., European, Asian and African) were coded as *Other*. As a result, 660 (89.1%) of the sample were *Native*, 37 (5.0%) were *Turkish & Balkans*, and 44 (5.9%) were *Other*. Since all participants spoke one of Switzerland's two dominant national languages, they received all instructions and questionnaires in either German or French.

Somatization

Somatization was measured using the *Somatization* dimension (12 items) of the Symptom Checklist-90-Revised (SCL-90-R), a self-report symptom inventory designed to reflect psychological symptom patterns with a time reference of the past seven days.[37] The dimension reflects distress arising from bodily perceptions, including the cardiovascular, gastrointestinal, and respiratory system, as well as other systems with autonomic mediation. Distress severity is rated on 5-point rating scales with the anchor points 0 (=not at all) to 4 (=extremely). The dimension has a Cronbach's α of 0.86,[38] and its separate use validly assesses somatization and MUPS.[39] The SCL-90-R itself is widely used and a valid and reliable measure for psychological distress, both in English, German, and French.[40,41]

Coping

Coping strategies were assessed with the Individual Coping Questionnaire (INCOPE-2), a 23-item questionnaire consisting of six subscales that reflect a variety of individual coping strategies for psychosocial stress.[42] Items are rated on 5-point rating scales with respect to the frequency with which a subject self-reportedly uses each coping strategy in everyday life, with anchor points 0 (=never) and 4 (=always). Cronbach's α for the entire scale is 0.72. The subscales Rumination; Expression of Negative Emotions; Negative Relaxation Strategies; and Withdrawal/Avoidance form the dimension *Dysfunctional Coping*. Positive Self-Verbalization and Active Problem Solving form the dimension *Functional Coping*. The two main dimensions have internal consistencies of $\alpha = 0.71$ respectively $\alpha = 0.70$ and demonstrate satisfactory concurrent and predictive validity.[42] For the francophone participants, a French version was created through forward and back translation of the German original by a bilingual officer of the Psychologic-Pedagogic Service.

Social support

Social support was measured with the Social Support Questionnaire F-SozU.[43] The F-SozU operationalizes social support as perceived support from one's social surroundings. It assesses the subjective belief of receiving support from others in the event of need as well as the prediction of being able to fall back on resources from one's social environment. Items are rated on 5-point rating scales with respect to agreement to the statements contained, with anchor points 1 (=strongly disapprove) and 5 (=strongly approve). Higher scores represent more social support. To reduce subject burden and increase rate of completion we used the short version (K-14) of the F-SozU. This unidimensional version consists of 14 items and exhibits very good psychometric item properties and reliability (Cronbach's $\alpha = 0.94$). The scale's validity reveals strong evidence for its usefulness.[44] For the francophone participants, a French version was created through forward and back translation of the German original by a bilingual officer of the Psychologic-Pedagogic Service.

Statistical Analyses

Testing the assumptions of the statistical analyses revealed that social support was independent of *Somatization* but associated with coping styles (see section Results). We thus used social support as a covariate only in the testing of our second hypothesis. Additionally, variances and covariances of the dependent variable *Somatization* were heterogeneous in the unequally sized ethnic groups, with smaller samples exhibiting larger variances than the larger sample. This resulted in a significant Box's *M*-test even when using the more conservative level of significance of alpha <0.001, as advised with unequal sample sizes. Accordingly, for our first hypothesis we used a Kruskal–Wallis test with ethnic background as categorical factor and *Somatization* as dependent variable. *Post hoc* pairwise comparisons using Mann–Whitney *U* tests were used to identify the source of a significant result. For our second hypothesis, we used a MANCOVA with ethnic background as categorical factor, *Social Support* as covariate, and *Functional Coping* and *Dysfunctional Coping* as the two dependent variables. The nominal level of significance was set at alpha <0.05. All statistical computations were performed with SPSS 24.0 (IBM Corporation, Armonk NY, USA) for Windows.

RESULTS

Statistical Assumptions

Pearson correlations revealed that the level of social support during basic training was significantly associated with both *Functional Coping* and *Dysfunctional Coping*, but not with *Somatization* (Table I). An ANOVA revealed that the level

TABLE I. Pearson Correlations Between Social Support, Somatization, and Coping Strategies ($N = 648$)

	1	2	3	4
1) F-SozU (Social Support)				
2) SCL- 90 – Somatization	−0.048			
3) INCOPE-2 Functional Coping	0.222**	−0.136**		
4) INCOPE-2 Dysfunctional Coping	−0.089*	0.077*	−0.054	
M (SD)	3.50 (0.60)	0.66 (0.74)	2.20 (0.57)	1.36 (0.50)

*$p \leq 0.05$, **$p \leq 0.01$.

of social support during basic training was independent of the recruits' ethnic background, $F(2,729) = 0.546$, n.s.

Somatization (SCL-90-R)

Somatization levels were significantly different between the ethnic groups, χ^2 (2, $N = 654$) = 12.83, $p \leq 0.01$, $\eta^2 = 0.02$. *Post hoc* Mann–Whitney *U* tests examined pairwise differences among the three groups, controlling for Type I error across tests by using the Bonferroni approach. These tests indicated a significant difference only between the ethnic groups *Native* ($N = 590$, $Mdn = 0.42$) and *Other* ($N = 38$, $Mdn = 0.75$), $U = 7{,}731.5$, $p \leq 0.01$, $r = 0.13$.

Coping Strategies (INCOPE-2)

Results of the multivariate tests showed that coping strategies did not differ between the ethnic groups, but were related to social support levels, $F(2/725) = 18.93$, $p \leq 0.01$, Wilks' $\Lambda = 0.95$, partial $\eta^2 = 0.050$. There was no interaction effect, either. Between subject effects showed that the recruits' social support levels were significantly associated with both *Functional Coping* ($F(1/726) = 32.46$, $p \leq 0.01$, partial $\eta^2 = 0.043$) as well as *Dysfunctional Coping* ($F(1/726) = 6.87$, $p \leq 0.01$, partial $\eta^2 = 0.009$). For the strength and direction of these associations, see the correlation coefficients in Table I.

DISCUSSION

The key findings of the present study were that Swiss minority recruits with a heterogeneous ethnic background exhibited significantly higher levels of somatization in the third week of basic training than their Swiss native comrades or those with an ethnic background from Turkey or the Balkans. Coping styles did not differ among these groups. However, social support showed a small association with dysfunctional coping and an almost medium association with functional coping.

Even though somatization levels were associated with ethnic minority status, our first hypothesis itself was not met, nor was our second hypothesis. In our opinion, the present data add nonetheless to the current literature in an important way, as we could show that greater somatization in members of ethnic minorities occurs also in naturalized young adults in a highly specific situation such as basic military training.

Before interpreting these results, a few issues need to be addressed. Although our sample was twice as large as required to be considered representative in random sampling,[45] factual constraints guided the drawing of the sample, thus limiting representativeness. The two minority groups were comparably small, and especially the group *Other* was ethnically heterogeneous. Variance in this group was thus large and may partially account for the results. Furthermore, the effect size of the significant difference was small. Lastly, there was no possibility to assess whether there was a non-participation bias amongst any of the three ethnic groups, since the Swiss Armed Forces does not survey the ethnic background of recruits as a general practice.

Regarding the higher levels of somatization, transcultural psychology indicates this may stem from a culturally distinct experience of body and mind. Many non-Western cultures endorse a holistic anthropology, where mind and body constitute a unity and psychosocial distress is expressed accordingly.[10,46] Western Europeans, however, subscribe to a Cartesian mind-body dichotomy and in expressing psychosocial distress focus on the mind, neglecting physical experiences.[47] Cultural differences in somatization rates thus have a likely foundation in a differing attention to symptoms.[48] Somatization might also be the most expedient way of communicating psychological distress,[10] as ethnic minorities – especially if they are first generation immigrants – lack fluency in their host nation's language. Somatic problems are much easier to communicate to a health care professional. Second (and maybe even third) generation immigrants would likely adopt and thus continue this behavior by modeling, as Uluşahin, Başoğlu, and Paykel suggest.[25] This effect would be exacerbated in a military setting, where lacking mental resilience is more stigmatized than a deficit in physical resilience, in turn discouraging service members from ethnic minorities to seek necessary mental health counseling.[49]

There is regrettably little to speculate on the fact that only the ethnically heterogeneous minority subjects exhibited higher somatization levels while those with an ethnic background more commonly associated with this phenomenon (i.e., Turkey and Balkans) did not. One reason might be that intra-minority intergroup relations (i.e., attitudes and behaviors of one minority group towards members of another minority group) might mirror classic majority-minority relations.[50] Recruits of Turkish or Balkan extraction constitute majorities amongst the minority. The several smaller minority groups that formed the group *Other*, however, lack this strength in numbers and the related social capital and informal privileges. Negative intra-minority intergroup relations can result in members of smaller (especially "visible") minority groups to experience discrimination and marginalization not only from the majority group, but also from dominant minority groups. And perceived discrimination has been shown to act as a moderator for both mental and physical health in ethnic minorities.[51,52]

The fact that functional coping was positively associated with higher levels of perceived social support (and vise versa) would also support this line of reasoning. It also supports those coping models that identify social support seeking as a specific coping strategy. While seeking social support is distinct from perceived social support itself, it is unsurprisingly an important contributing factor to the latter.[53,54] The recruits' reported level of social support may thus reflect the result of active coping activity, and not just a passive experience of support from their family or community.

These findings have ramifications for both military cadre, military doctors and military health care professionals.

Military cadre in basic training should be aware that if recruits from ethnic minorities complain about physical discomfort, it need not be a medical problem or a sign of malingering, but rather a symptom of psychological distress. Accordingly, they will be better suited to exercise their responsibility as military leaders to adequately manage these cases. Military doctors and military mental health professionals, too, should consider these results when engaging with recruits from ethnic minorities, as cross-cultural miscommunication can hamper clinical encounters.[55] Predominantly somatic complaints or MUPS can mask affective problems or be part of an adjustment disorder symptomatology. Awareness of this can contribute to reducing the risk of misdiagnosis. As human resources are not as readily available to armed forces anymore, even in countries with the conscription, taking these findings into account is not only in the best interest of the recruit himself, it could also increase the military's retention rate. Every recruit – independent of ethnicity – has both the obligation and the right to do his military service in an environment that is both challenging and supportive. Only thus can armed forces legitimately assert their claim of not only training soldiers ready for operations but also supporting them in becoming valuable members of society. For as Leuprecht put it, "armed forces like to think of themselves of turning citizens into soldiers, but they play just as important a role in turning soldiers into citizens."[5]

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Self-reported emotion regulation is associated with response to test of cardiac vagal function

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Abstract

Background: Parasympathetic function and emotional self-regulation (ESR) share neuroanatomic structures. Based on Porges' Polyvagal Theory and the Neurovisceral Integration Model (NIM), we compared vagally mediated heart-rate variability (vmHRV) with psychometrically assessed ESR. We hypothesized that vmHRV and ESR would be associated during rest, a vagal function test, and recovery from that test. A significant association would justify the psychometric measuring of parasympathetic health, which is less burdensome than its psychophysiological assessment. Methods: 213 healthy males (aged 18 to 26, $M = 20.29$) took part in the present study. They completed the Emotion Regulation Questionnaire (ERQ) and underwent the Cold-Face Test (CFT) for four minutes wearing ambulatory electrocardiograms. High frequency (HF) band was used as a measure of vmHRV before, during, and after the CFT. Associations between the HF band and ESR were analyzed with partial rank correlations. Results: There was no significant association between ERQ scores and the response to the CFT itself. But there was an almost significant association between the ERQ scale *Cognitive Appraisal* and baseline vmHRV, and a significant association between *Cognitive Appraisal* and cardiac recovery from the CFT, i.e., participants with higher scores on that ESR scale revealed a tendency to exhibit greater vmHRV during baseline and they clearly exhibited greater vagal withdrawal during recovery from the CFT. Discussion: Cognitive appraisal as a psychometrically assessed emotion regulatory process was reflected in a more flexible parasympathetic activity (i.e., better cardiac vagal health) during recovery from an exclusively physiological stressor. This lends convergent validity to self-reported emotion regulation, and justification for its use as a measure of ESR as a trait, offering further support for the Polyvagal Theory and NIM.

Key words: emotional self-regulation; Cold Face Test; heart rate variability; cardiac vagal function; Polyvagal Theory

1. Introduction

Feelings constitute a crucial component of the mechanisms of life regulation, and their physiological substrates can be found at all levels of the nervous system (Damasio & Carvalho, 2013). The emotions that humans experience while interacting with their environment are associated with varying degrees of physiological arousal. Emotion regulation depends critically on an individual's ability to adjust physiological arousal on a momentary basis. A key system involved in the generation of this arousal is the autonomic nervous system (ANS) (Levenson, 2006). A flexible ANS allows for rapid generation or modulation of physiological and emotional states in accordance with situational demands. In contrast, autonomic rigidity results in a lesser capacity to generate or alter physiological and emotional reactions in response to changes in the environment (Gross, 2008). The ANS is divided into an excitatory sympathetic nervous system (SNS) and an inhibitory parasympathetic nervous system (PNS), which often interact antagonistically to produce varying degrees of physiological arousal. Activation of sympathetic fibers has an excitatory influence on the firing rate of the heart's primary pacemaker and results in increased heart rate, i.e., tachycardia. In contrast, cardiac parasympathetic activation (mediated by the Nervus vagus; N. vagus) has an inhibitory influence and results in decreased heart rate, i.e., bradycardia. Both autonomic branches exert a constant influence on heart rate, and tachycardia can arise from either increased sympathetic activity or decreased parasympathetic inhibition (and vice versa). Parasympathetic influence, however, predominates when at rest (Appelhans & Luecken, 2006).Since cardiac parasympathetic activity is controlled by the N. vagus, parasympathetic activation is also called vagal activation (associated with bradycardia), and parasympathetic inhibition is called vagal withdrawal (associated with tachycardia). The latter has been linked to better performance in response to emotional challenges (Scrimin et al., 2019).

Porges' Polyvagal Theory (Porges, 1995, 2003) brought the role of the N. vagus in the regulation of emotions to prominence and described the links between parasympathetic activity and emotional expression. Subsequently a consistent body of research has documented the association between deficiencies in cardiac vagal function and emotional dysregulation (Beauchaine et al., 2013). The Polyvagal Theory suggests that emotion regulation is associated with the functions of the ventral vagal complex. The latter's pathways are connected to facial expression, vocalization and listening, and it facilitates calm behavior by inhibiting the sympathetic influences on the heart and by dampening the stress response of the hypothalamic-pituitary-adrenal (HPA) axis. Similarly, the Neurovisceral Integration Model (NIM) suggests that vagally-mediated heart rate variability (vmHRV) serves as an indicator of flexible control of the PNS over psychological and health-related processes (Thayer et al., 2012), including a capacity for regulated emotional responding (Appelhans & Luecken, 2006).

The variation in heart rate produced by respiration is called respiratory sinus arrhythmia (RSA) (Bernardi et al., 2001). As only cardiac parasympathetic activity possesses a latency of action rapid enough to covary with respiration, RSA is a phenomenon known to be entirely mediated by the PNS. In fact, most of the parasympathetically mediated variation in heart rate is produced by RSA (Berntson et al., 1997). Many researchers have treated the magnitude of RSA as an index of vmHRV on the assumption that it serves as a linear index of vagal tone (Shaffer & Ginsberg, 2017). However, this view has been challenged and, strictly speaking, pure RSA is an estimate of parasympathetically mediated HRV rather than of vagal tone (Pyetan & Akselrod, 2003).

The connection between vagal function and emotion regulation suggested by the Polyvagal Theory and NIM results in part from sharing the same neuroanatomic structures. The ventromedial prefrontal cortex plays a key role in emotion regulation by making important contributions to coping with stressful affective situations (Davidson et al., 2000;

Haghighi et al., 2017; Jahangard et al., 2019; Sutton & Davidson, 2000). It is also associated with cardiovascular changes that are mediated by parasympathetic activity through the N. vagus (Hänsel & von Känel, 2008; Ray & Zald, 2012).

1.1 Mental health and vagal activity

Flexible parasympathetic function has been shown to be an indicator of mental wellbeing and health. Higher resting vagal tone is linked to greater psychological well-being (Kok & Fredrickson, 2010), positive emotionality (Oveis et al., 2009), and reduced dysfunctional coping (El-Sheikh et al., 2001). Correspondingly, attenuated baseline RSA and excessive RSA withdrawal to emotional challenges have been observed in children and adolescents with mental health and behavioral problems (Beauchaine et al., 2013). This phenomenon crosses into adulthood, as reduced vagal function is associated with depression (C.-C. Chang et al., 2018; Williams et al., 2015), generalized anxiety disorder (H.-A. Chang et al., 2020), and lack of emotional clarity and impulse control (Williams et al., 2015). Low levels of the HRV high frequency (HF) - primarily influenced by RSA - have specifically been shown to be an indicator for the state of depression in clinical populations (Hartmann et al., 2019; Koch et al., 2019). Additionally, reduced HF in patients with social anxiety disorder both at rest and upon emotional processing suggests a relationship between psychopathology and decreased parasympathetic flexibility (Gaebler et al., 2013).

In experimental settings, individuals with higher resilience exhibit higher resting vagal tone and greater vagal withdrawal during psychological stress; they also display not only faster, but also more pronounced vagal activation afterwards, i.e., better cardiac recovery (Egizio et al., 2008; G. G. L. Souza et al., 2007; Gabriela Guerra Leal Souza et al., 2013; Tugade & Fredrickson, 2004; Weber et al., 2010). Similarly, vagal withdrawal in response to a strong emotional stimulus is associated with adaptive emotion regulation (Gentzler et al., 2009) and effective emotion regulation (Katz & Rigterink, 2012). Graziano and Derefinko (2013) found evidence in their meta-analysis for the crucial role of vagal regulation in the

social behavior of children: both lower absolute levels of baseline cardiac vagal tone as well as reduced vagal withdrawal were linked to more externalizing behavior problems (i.e., lack of self-control). Conversely, greater vagal withdrawal was associated with fewer emotional problems (i.e., stress, anxiety, worry). A systematic review by Fanti et al. (2019) identified in children and adolescents with conduct disorder not only lower RSA reactivity, but also reduced cardiac pre-ejection period (PEP) reactivity when confronted with emotional tasks. This parasympathetic and sympathetic co-inhibition points to low stress responsivity, which in turn is related to the likelihood of antisocial behavior.

In conclusion, research indicates that higher resting cardiac vagal tone as well as the capacity for pronounced vagal withdrawal is associated with several positive aspects of mental health, e.g., resilience and emotion regulation.

1.2 Emotional self-regulation and mental health

Emotional self-regulation (ESR) is a coping mechanism with a beneficial effect on mental health. On the one hand, stressful life events reduce subjective well-being when the ability to self-regulate affect is impaired; on the other hand, the ability to self-regulate emotions moderates the influence of stress on psychological well-being (Baumeister & Vohs, 2004; Gross & Muñoz, 1995). Individuals with good self-regulation competences have substantially fewer mental health problems than those with lower self-regulation competences when under increased stress (Kadzikowska-Wrzosek, 2012). In this regard, coping through emotional regulation is a construct involving two component processes, both conceptualized as intentional attempts to manage demands during stressful experiences (Westphal & Bonanno, 2004). These are respectively emotional processing (understood as attempts to acknowledge, explore, and understand emotions) and emotional expression (understood as verbal and/or nonverbal efforts to communicate or symbolize emotional experience). Research has shown that both emotional processing and expression promote well-being and health in a range of stressful circumstances (Stanton, 2010). Additionally, a meta-analytical

correlational review of 13 studies showed that reappraisal and positive re-evaluation - both consisting of emotional processing - belonged to the most functional coping strategies (Campos et al., 2004). Individuals infrequently and ineffectively regulating their emotions (i.e., low regulators) also reported more marked symptoms of depression, anxiety, and posttraumatic stress disorder. In contrast, individuals with frequent and effective use of reappraisal and low levels of suppression (i.e., high reappraisers/low suppressors) reported the lowest levels of symptoms of depression and anxiety, suggesting that this specific combination of emotion regulation is the most adaptive (Eftekhari et al., 2009). Accordingly, emotion dysregulation significantly mediated the relationship between cumulative adversity and depressive symptomatology independent of risk status. Overall, in a large community sample of adults, cumulative adversity and emotion dysregulation accounted for 50% of the variance in depressive symptomatology (Abravanel & Sinha, 2015).

Reappraisal, suppression, and rumination are emotion regulation techniques utilized to alter the affective components of stress (Lazarus & Folkman, 1999). From a neuropsychological point of view, reappraisal involves an activation of prefrontal cortical areas that reduce the activity in limbic areas such as the amygdala (Buhle et al., 2014; Hallam et al., 2015). Suppression and rumination involve similar brain areas but have different patterns of activation. Pathologically chronic stress, e.g., posttraumatic stress disorder (PTSD), is associated with dysfunctional disruptions in emotion regulation, expressing itself in symptoms such as suppression and rumination (Ragen et al., 2016). The use of suppression has also been shown to be linked to stronger depressive symptoms in an international sample, whereas the use of cognitive reappraisal showed no such association (Chahar Mahali et al., 2020). In contrast, functional emotion-regulation moderates the association between perceived stress and both depression and happiness (Extremera & Rey, 2015). A gender-specific analysis showed that this moderation effect was only significant for males, however. When males reported a high level of perceived stress, those with high ESR scores recorded higher

scores for subjective happiness and had fewer symptoms of depression than those with low ESR scores (Extremera & Rey, 2015). Additionally, high trait emotional intelligence (TEI) was negatively associated with psychological distress due to the moderating effect of ESR (Beath et al., 2015). Study findings also showed that regulation of emotions was conducive to reducing interpersonal conflict and subjective stress (Mulki et al., 2015).

To summarise, previous research has shown that a) better cardiac vagal activity is associated with greater emotional self-regulation, and that b) greater emotional self-regulation has a moderating effect on stress-related psychological disorders with psychophysiological factors both in their etiology and symptomatology. Lastly, ESR has been shown to be based at least in part on an underlying neuropsychological substrate. Psychological traits such as ESR are mostly measured by paper-and-pencil assessments, but there are questions regarding the validity of such an approach. Self-reports are prone to flaws, especially when it comes to emotions, and many psychological trait models are informed by biological theory and would thus merit psychophysiological assessments (Geus & Neumann, 2008; Mauss & Robinson, 2009).

Taking these findings into account, in the present study we assessed a sample of 213 males and asked whether and, if so, to what extent subjectively and objectively assessed ESR overlap. Our overarching hypothesis was that the psychometric measurement of ESR is reflected to a significant extent in psychophysiological measures of cardiac vagal function (i.e., parasympathetic "health"). More specifically, the following three hypotheses were formulated, following Eftekhari et al. (2009), Graziano and Derefinko (2013), Porges (1995, 2003), Ragen et al. (2016), Souza et al. (2013), and Weber et al. (2010). We anticipated that higher levels of reappraisal and lower levels of suppression would be associated with a higher baseline of vmHRV (hypothesis 1); with an increase of vmHRV during a physiological test of cardiac vagal function (hypothesis 2); and with greater vagal withdrawal (i.e., a greater

vmHRV decrease) during recovery from a physiological test of cardiac vagal function (hypothesis 3).

The present study aimed to expand upon existing knowledge by demonstrating that self-reported emotional regulation is reflected not only in the cardiac vagal response to acute emotional challenges but also towards a purely physiological stimulus. This in turn would indicate that ESR has a subsistent physiological substrate in the PNS. If this is the case, psychometrically assessed ESR would prove itself to be a valid indicator of parasympathetic cardiac vagal health.

2. Method

2.1 Procedure and Sample

This investigation was part of a larger multi-organizational project[1] on mental and physical health during basic military training in the Swiss Armed Forces. The Ethics Committee of the Canton of Aargau (Switzerland) approved the project. Switzerland has compulsory military service for men of legal age. After a two-day recruitment procedure involving physical and psychological examinations, every able-bodied young man is approved for military service. These recruits may therefore be considered as representative of the population of physically and mentally healthy young Swiss males. Sample size was determined by the practical constraints of the cooperating boot camp (i.e., number of recruits). Participants were recruited (overall: n = 694) during the first week of basic military training in 2011. Participants were fully informed about the aims of the study, the voluntary basis of their participation and the anonymous data handling. Thereafter, recruits interested in participation signed a written informed consent (n = 651). Inclusion criteria were first language German (Switzerland is a multilingual country) and male sex (n = 569). Exclusion criteria were first language Italian or French (n = 81) and female sex (n = 1). Due to limits regarding time and

[1] See Legends (p. 32)

the availability of electrophysiological devices, 243 recruits were randomly selected by lot from the pool of potential subjects to participate in the study. Of these, 30 (12.3%) reported experiencing facial or dental pain during the CFT; these individuals were eliminated from the analyses due to expected respiratory artefacts in the HRV data. The final sample therefore consisted of $N = 213$ healthy male Swiss Armed Forces recruits (aged 18 to 26, $M = 20.29$, $SD = 1.17$).

2.2 Instruments

2.2.1 Emotion Regulation

The Emotion Regulation Questionnaire (ERQ) was used to measure emotional self-regulation (Gross & John, 2003). The ERQ is a 10-item questionnaire designed to measure respondents' tendency to regulate their emotions. It consists of two scales, *Cognitive Reappraisal (CR)*, consisting of 6 items, and *Expressive Suppression (ES)*, consisting of 4 items. Respondents answer each item on a 7-point Likert-type scale ranging from 1 (= strongly disagree) to 7 (= strongly agree). The two scales show good convergent and discriminant validity as well as internal consistency; Cronbach's α for *CR* between .75 and .82, and for *ES* between .68. and .76. Gross and John (2003) have shown that respondents scoring high on *CR* experience and express greater positive emotion and less negative emotion; they also exhibit better interpersonal functioning, and experience greater well-being. Those scoring high on *ES*, however, experience and express less positive emotion, experience greater negative emotion, exhibit worse interpersonal functioning and experience less well-being.

2.2.2 Test of cardiac vagal function

The Cold Face Test (CFT), also known as the diving reflex test, was used to test participants' cardiac vagal function and thereby the flexibility of their PNS. The CFT causes bradycardia and peripheral vasoconstriction and is a test of autonomic pathways (Heath & Downey, 1990); it has been used to test cardiac vagal function (Khurana & Wu, 2006) and

elicits a HRV increase in healthy subjects (Iorfino et al., 2016; La Marca et al., 2011). The entire CFT lasted four minutes and was segmented into four 60-second intervals. Participants received instructions regarding the CFT while resting in a seated position. They were then fitted with a chest belt heart rate sensor measuring their ECG, after which an entire pre-baseline segment of 60 seconds was taken. This pre-baseline segment was not used in the analyses for methodological reasons (e.g., avoiding artifacts from participants' adaptation). Following this, the actual first segment, i.e., the 60 second baseline, was taken. After these 60 seconds they underwent the CFT. Cold stimulus was applied for 120 seconds (i.e.; segments two and three) with 0.5°C cold gel-filled compresses applied bilaterally to the entire face. Afterwards, the compresses were removed and during the following 60 seconds (i.e., segment four) the recovery phase was measured. Consequently, the first segment constituted the *Baseline*, the second segment the *CFT 1st Half*, the third segment the *CFT 2nd Half*, and the fourth segment the *Recovery*.

2.2.3 Vagally mediated heart rate variability (vmHRV)

Cardiac activity was measured continuously using an ambulatory electrocardiogram (ECG; Equivital System; Hidalgo, Cambridge, UK), consisting of a horizontal chest belt with three embedded electrodes around the user's chest beneath the pectorals. ECG data was imported, edited, and analyzed using the VivoSense software (Vivonoetics, US). Sampling rate was 256 Hz. Participants sat in an upright position in order to minimize motion artifacts in the ECG signal, which was visually examined for artifacts and edited to correct for ectopic beats and arrhythmias by using linear interpolation. Each of the four segments of the CFT constituted a 60-second ECG epoch; the average of the absolute power of the high frequency (HF) band (ms^2) was calculated with Fast Fourier Transformation (FFT) with a window overlap of 0% and a resampling rate of 10. For our analyses we then used the natural logarithm of these HF values, i.e., LnHF. There were two reasons for choosing both this index and this transformation. Firstly, the HF band occurs at the frequency of adult respiration, i.e.,

between .15-.40 Hz, and primarily reflects cardiac parasympathetic influence due to RSA (Appelhans & Luecken, 2006). Since HF power itself only indexes vagal modulation of the heart rate, and not vagal tone per se (Levenson, 2006), we used its natural logarithm, as this transformation estimates vagal tone under controlled conditions while breathing at normal rates (Egizio et al., 2011). Secondly, while guidelines on the measuring of HRV (Malik et al., 1996) strongly suggest the use of 5-minute bins to compute HRV, the short duration of the CFT protocol compelled us to use 60-second intervals (i.e., ultra-short-term measurements) to measure vmHRV, which has an effect on validity (Shaffer & Ginsberg, 2017). In the case of HF (ms^2), however, ultra-short-term and short-term measurements show strong correlations (McNames & Aboy, 2006), and measurements derived from bins as short as 20 seconds have been shown to correlate sufficiently with those derived from 5-minute bins. Furthermore, Laborde et al. (2017) and Quintana et al. (2016) advise a minimum time of 1 minute to compute HF.

2.2.4 Statistical analyses

To identify a cardiac reactivity profile over the time course of the CFT, a repeated-measures ANOVA with two-tailed significance was conducted for the vmHRV from *Baseline* to *Recovery*.

Due to heteroscedasticity, inconsistent normality of the variables, and the assumption that vmHRV and emotional regulation in response to stimuli are not linearly associated (Beauchaine, 2012; Graziano & Derefinko, 2013), we used bivariate rank correlations to examine the association between cardiac activity and the ERQ scores. In a second step, in order to account for the law of initial values (i.e., higher physiological baseline values predict greater physiological responses during challenges; Lacey & Lacey, 1962) we used partial rank correlations to test hypotheses 2 and 3, controlling for cardiac activity during *Baseline*. Bonferroni corrections of significance were applied for all multiple rank correlations and one-

tailed levels of significance were used, as both literature and our hypotheses indicate the directions of the association between vmHRV and reappraisal respectively suppression.

To test our first hypothesis, we examined the correlations between the ERQ scale scores and the LnHF during *Baseline*. Since emotional processes unfold over time and the underlying parasympathetic regulation is considered to be a dynamic process, static measures such as arithmetic change scores are not considered optimal indices of vagal activation (Brooker & Buss, 2010; Burt & Obradović, 2013). We therefore decided to test our second hypothesis by examining the correlations between the ERQ scale scores and the area under curve (AUC) of the LnHF from *Baseline* to *Recovery*. The AUC is frequently used in endocrinological and neuroscientific research to analyze repeated measurements over time and results in a measure related to the total output of a physiological system (Pruessner et al., 2003). To test our third hypothesis, we examined the correlations between the ERQ scale scores and the arithmetic difference (Δ) of the LnHF between *Recovery* and *CFT 2nd Half*. A greater parasympathetic activation during the CFT and a subsequent stronger parasympathetic inhibition, i.e., vagal withdrawal (in both cases indicating a better cardiac vagal response) would result in a larger negative Δ. The hypothesized correlation would thus be negative.

All analyses were performed with SPSS® 24 (IBM Corporation, Armonk NY, USA) for Windows®.

3. Results

3.1 Psychometric criteria of the ERQ

Considering the small numbers of items, both ERQ scales exhibited a sufficient to good internal consistency, with *Cognitive Reappraisal* ($M = 4.46$, $SD = 1.12$) showing a Cronbach's $\alpha = .81$, and *Expressive Suppression* ($M = 4.11$, $SD = 1.13$) a Cronbach's $\alpha = .67$.

3.2 Profile of cardiac vagal activity during CFT

Mauchly's test indicated that the assumption of sphericity had been violated ($\chi 2(5) = 52.2$, $p < .001$), therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = 0.87$). An ANOVA with repeated measures showed that LnHF changed significantly over the course of the CFT, i.e., from *Baseline* to *Recovery*, ($F(2.61, 553.43) = 50.75$, $p = .00$, partial $\eta^2 = .19$). These results indicate that the CFT did indeed result in a LnHF change over time consistent with cardiac vagal activation (see Fig. 1).

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Figure 1 here

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3.3 Bivariate correlations between ERQ scales and cardiac vagal activity during CFT

There was an almost significant positive correlation between *Cognitive Reappraisal* scores and LnHF scores at *Baseline* ($r_s = .14$, $p = .06$; see column 4 in Table 1). There was no significant positive correlation between *Cognitive Reappraisal* and the AUC of LnHF from *Baseline* to *Recovery*. Finally, there was an almost significant negative correlation between *Cognitive Reappraisal* and LnHF change from *CFT 2nd Half* to *Recovery* ($r_s = -.14$, $p = .06$; see column 4 in Table 1). *Expressive Suppression* showed no significant correlations with any of the LnHF scores.

3.4 Partial correlations between ERQ scales and cardiac vagal activity during CFT

When controlled for LnHF during baseline, the only significant association was the negative correlation between *Cognitive Reappraisal* and the LnHF change between *Recovery* and *CFT 2nd Half* ($r_s = -.13$, $p = .03$; see column 2 in Table 1), indicating that participants with higher *Cognitive Reappraisal* scores exhibited a greater reduction in their LnHF scores once the CFT had ended.

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Table 1 here

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4. Discussion

In the present study we examined the association between emotional self-regulation and cardiac vagal function in healthy male adults. The key finding of the present study was that the psychometrically assessed trait of cognitive reappraisal (i.e., an emotional regulatory process) was associated with vagal recovery based on an exclusively physiological assessment of cardiac vagal function. The present results therefore add to the literature in an important way: emotional regulation is not only reflected in cardiac vagal response towards psychological stressors (e.g., mental tasks, social situations etc.), but it is also an indicator for general cardiac vagal function and has a physiological substrate in the PNS. This indicates that self-reported emotional self-regulation (even in as short a version as the ERQ) is a valid indicator for parasympathetic cardiac vagal health and is thus a defensible choice as an assessment method.

Three hypotheses were formulated, and each of these is considered in turn. Our first hypothesis was that there would be an association between functional and dysfunctional emotional regulation styles and HRV baseline before the CFT, and this was barely supported; the ERQ scale *Cognitive Appraisal* and baseline HRV were almost significantly positively correlated. This result is consistent with the findings of other studies that have examined the relationship between mental health and resting cardiac vagal tone (Baumeister & Vohs, 2004; Kadzikowska-Wrzosek, 2012; Stanton, 2010). It is also congruent with prevailing research and may thus lend credence to the validity of the other more novel findings from the study.

Our second hypothesis was that there would be an association between emotional regulation scores and HRV increase during the CFT. There was no significant correlation

between either ERQ scale and the AUC of HRV (i.e., the total 'output' of the cardiac vagal system) during the CFT, with or without controlling for *Baseline* values. It follows that the present pattern of results does not match previous results (Scrimin et al., 2019). The data available from the study is insufficient to shed light on underlying psychophysiological processes here, but to explain the gap between the present and previous results, we will advance a tentative explanation after evaluation of our third hypothesis.

Our third hypothesis was that there would be an association between emotional regulation scores and HRV decrease during recovery from the CFT. This hypothesis was supported as there was a significant partial correlation between the ERQ scale *Cognitive Reappraisal* and the HRV decrease from the second half of the CFT to recovery after controlling for baseline HRV scores. This indicates that participants with higher scores on the ERQ scale *Cognitive Appraisal* exhibited greater vagal withdrawal after the CFT. This result is relevant because Graziano and Derefinko (2013) concluded from the results of their meta-analysis the need to control for baseline RSA levels when examining RSA withdrawal. Acknowledging the barely significant correlation in the first hypothesis and the small effect sizes of all detected associations, the fact that these results were achieved using a scale consisting of merely six items encourages us nonetheless to conclude the following: participants who regulate emotions by engaging in cognitive reappraisal tend to exhibit greater HRV during rest, and they exhibit greater vagal withdrawal after a simulated dive response such as the CFT, constituting a more flexible cardiac recovery as the sympathetic system regains influence. This indicates not only better cardiac vagal health but also greater autonomic flexibility, which in turn facilitates a swifter fight-or-flight response when necessary.

While we found partial support for two hypotheses, one hypothesis could not be confirmed. We offer the following explanation that takes into account the results of all three hypotheses. The CFT proves to be a physiologically dominating stimulus of the vagal system

that overrides the more subtle emotional regulatory capacities expressed within the PNS (i.e., no confirmation of hypothesis two). After termination of the CFT, however, the participants' cognitive reappraisal capacities "kick in" during recovery from the physiologically stressful stimulus and they take the foot off the vagal 'brake' (i.e., engaging in vagal withdrawal, in confirmation of hypothesis three).

Since our sample consisted of psychologically healthy participants, it is unlikely that mental health issues (e.g., depression) acted as mediators for the observed association between HRV and ESR, thus suggesting a genuine link between the two. The results of Chahar Mahali et al. (2020) seem to substantiate this, as their clinical sample showed an association between depressive symptomatology and the ERQ scale *Suppression*, but not with *Reappraisal*. Our healthy sample, on the other hand, showed only associations between HRV and *Reappraisal*, but not with *Suppression*. Literature suggests strongly that dysfunctional ESR indicates lower mental health while functional ESR indicates better mental health.

The present study adds to the literature in an important way as we were able to show that cognitive factors of psychometrically assessed emotion regulation are reflected in parasympathetic function in response to a purely physiological (i.e., non-emotional) stressor. From a methodological point of view, this adds convergent and concurrent validity to the self-report measurement of emotion regulation.

Despite the novelty of the results, the following limitations warrant against overgeneralization of the findings. First, the sample consisted of young male adults; it is therefore unclear whether and, if so, to what extent the same patterns would hold for young adult females, or older adults, or indeed clinical samples. Second, we assessed psychophysiological stress responses under challenge conditions, while the assessment of baseline processes such as the cortisol awakening response could have provided more insight into individuals' basal stress reactivity. Third, it is conceivable that latent and unassessed dimensions such as personality traits or traumatic events had biased two or more dimensions

in the same or opposite directions. It follows that future studies might assess participants' stressful life events, current workplace-related stressors, and private stressors.

One of the primary aims of psychophysiological research is to specify the functional association between elements in the respective domains of psychology and physiology (Cacioppo & Tassinary, 1990). While it is unwise to assume an isomorphic relation between measures that have both psychological and physiological labels, it is nonetheless of importance to examine and identify psychometric measures that reflect their related physiological processes. Psychophysiological assessments are often invasive or at least cumbersome, in the latter case not only for test subjects but also for researchers. If psychometric measures can validly assess psychological traits associated with physiological processes, depending on the research question they may legitimately substitute psychophysiological measures. This would not only lessen the burden on research participants, but also reduce logistical efforts and expenses for researchers. In the present study, we were able to show that an emotional regulation scale consisting of only six items (i.e., cognitive reappraisal) was significantly correlated with vagal withdrawal after a physiological test of cardiac vagal function. We conclude that the small size of the association was primarily due to the shortness of the scale. We anticipate that additional research using valid and reliable cognitive reappraisal scales with a larger number of items will predict vagal withdrawal to a greater extent and allow a more differentiated assessment not only of parasympathetic flexibility but possibly also sympathetic reactivity. Further research should also examine whether mediating factors such as life events or personality traits mediate the relationship between parasympathetic flexibility and emotion regulation in healthy subjects.

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Tables

Table 1. Rank Correlations (Spearman Rho) between ERQ and HRV (LnHF) during Cold Face Test ($N = 213$).

		1	2	3	4	5
	Bivariate					
Cold Face Test	1) Baseline		-.08	.84**	.14†	-.08
Cold Face Test	2) Δ Recovery - 2nd Half			-.15*	-.14†	.03
Cold Face Test	3) AUC				.11	-.05
ERQ	4) Cognitive Reappraisal (CR)					.00
ERQ	5) Expressive Suppression (ES)					
	Partial (controlled for Baseline HRV)					
ERQ	4) Cognitive Reappraisal (CR)		-.13*	-.02		
ERQ	5) Expressive Suppression (ES)		.00	.03		
	M	8.68	0.54	26.56	4.47	4.12
	SD	1.27	1.01	3.71	1.12	1.13

Note. † $p < .10$, * $p < .05$, ** $p < .01$, Bonferroni corrected (one-tailed)

Figures

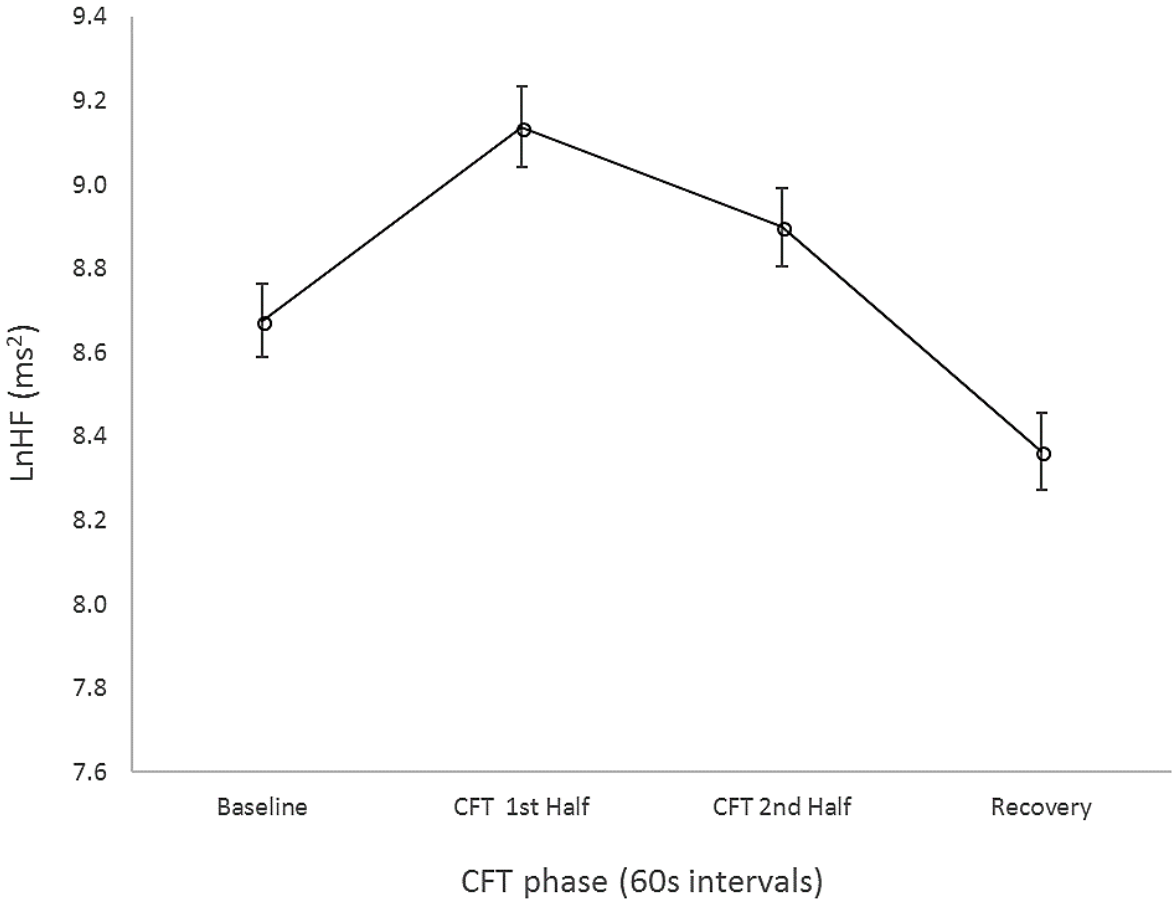

Figure 1. HRV measured in LnHF (ms^2) during Cold Face Test (M ± 1 SE) ($N = 213$)

Legends

[1] The project PROGRESS was a collaboration between the Swiss Federal Institute of Sport Magglingen, the University of Zurich, the Military Academy at ETH Zurich, and the Psychological-Pedagogical Service of the Swiss Armed Forces. Its aims were to study the influence of progressively structured physical activity and leadership styles on various factors such as fitness, number of injuries, frequency of resignations, military performance, and stress and motivation among Swiss recruits. However, these studies had not focused on the present topic of emotion regulation and cardiac vagal function. The current findings have therefore not been previously published and thus are novel.